



2016 Energy Standards – Residential Envelope

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*Local Building Officials
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Goals for this Training

- Identify/clarify the residential envelope requirements and major changes in the 2016 Energy Standards for:
 - Low-rise residential buildings (*in sequential order of sections*)
 - Newly constructed buildings, additions, and alterations
- Simplify compliance and enforcement of the 2016 changes during the:
 - Plan review process
 - Field inspection process



QUESTIONS...

- **Please feel free to ask at anytime:**
 - During class
 - During breaks
 - The end of class; or
 - After class





A Little CEC History

- Section 25402 of the Public Resources Code (known as the **Warren Alquist Act**)
- The act created the Energy Commission in 1974 and gave it authority to develop and maintain Building Energy Efficiency Standards
- Requires the Standards and new requirements to be cost effective over the economic life of the structure
- Requires the Energy Commission to update the Standards periodically (about every 3 years)

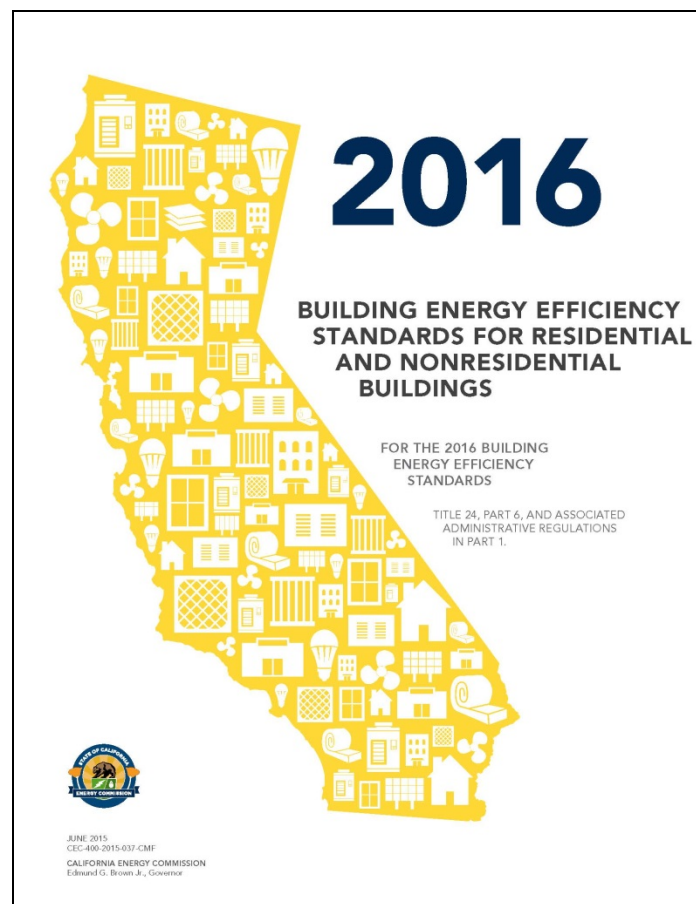


*Let's discuss the 2016
Building Energy Efficiency
Standards*



2016 Building Energy Efficiency Standards

- **Effective on Jan. 1, 2017**
 - Building permit applications submitted on or after this date
- **Master plans for tract homes affected:**
 - Need to resubmit if permits pulled on or after effective date





2016 Residential Energy Savings

- **Overall, 28% more efficient than 2013 Standards**
 - Electric savings = 345 GWHs
 - Demand Reduction = 115 MW
 - Gas Savings = 31 Mtherms
- **Monthly life cycle cost of \$11 with savings of \$31 for “typical” home (statewide)**





Summary of Major Changes

- **Solar ready zone exceptions revised**
- **High efficacy lighting**
 - New JA8 requirements
- **High Performance Attics (HPA)**
 - Insulation required at ceiling and at the roof
- **High Performance Walls (HPW)**
 - Maximum allowed U-factor lowered
- **Instantaneous water heaters**
 - Baseline for prescriptive and performance compliance

** See summary of changes handout*



California Energy Commission

2016 Building Energy Efficiency Standards

What's New for Residential

The most significant changes in the *2016 Building Energy Efficiency Standards* affecting residential buildings include the **new requirements for high-performance insulation within walls and attics**. Other changes include:

Mandatory Measures:

1. Insulation in roof/ceiling construction must be at least R-22 (maximum U-factor of 0.043) (§ 150.0(a)1).
2. New duct total leakage reduced to 5 percent or less (§ 150.0(m)11B1).
3. All installed air-conditioner and heat pump systems shall be equipped with liquid line filter driers as specified by manufacturer's instructions (§ 150.0(h)3B).
4. Storage hot water heaters no longer need to be externally wrapped (§ 150.0(j)1).
5. All luminaires must be "high-efficacy" (§ 150.0(k)1A).
6. Isolation valves must be installed on instantaneous water heaters that have a minimum input of 6.8 kBTU/hr (§ 110.3(c)7).

Prescriptive Compliance:

1. Increased flexibility for envelope compliance (§ 150.1(c)).
2. Increased roof assembly requirements to include insulation installed either above or below roof deck (§ 150.1(c)1A).
3. Requirements for water-heating systems in single-family and multifamily buildings have been updated and more options have been added (§ 150.1(c)8).
4. High-performance attics and ducts in conditioned spaces have been added as an option for a space-conditioning distribution system (§ 150.1(c)9).
5. If a whole house fan (WHF) is required, it must comply with a total air flow of at least 1.5 CFM/ft² and have 1 square foot of attic vent free area for each 750 CFM (§ 150.1(c)12).

Performance Compliance:

All compliance software programs that are approved by the Energy Commission must use a single interpretation of the performance compliance rules that the Energy Commission has integrated into the public domain software. More information is available in the *2016 Residential ACM Approval Manual* and the *2016 Residential ACM Reference Manual*.

Additions and Alterations:

1. Changes to the prescriptive requirements for the building envelope (specifically wall insulation) for additions (§ 150.2(a)1).
2. With alterations, the prescriptive requirements for mechanical cooling, water heating, and lighting have been revised (§ 150.2(b)).
3. More detailed information on additions and alterations in Chapter 9 of the *2016 Residential Compliance Manual*.

CALIFORNIA'S 2016 — RESIDENTIAL BUILDING ENERGY EFFICIENCY STANDARDS

CALIFORNIA ENERGY COMMISSION

The state's energy efficiency standards for new buildings and appliances have saved consumers billions in reduced electricity and natural gas bills. The building standards include better windows, insulation, lighting, air conditioning systems and other features that reduce energy consumption in homes and businesses. Since 1978 these standards have helped protect the environment by reducing more than 250 million metric tons of greenhouse gas emissions (or the equivalent of removing 37 million cars off California roads).

\$7,400 SAVINGS OVER A 30 YR. MORTGAGE | INITIAL COST \$2,700



HIGH EFFICACY LIGHTING

All lighting in new homes must be efficient. Installation of high quality lighting with controls that nearly halve the energy required for lights in new homes.



HIGH PERFORMANCE WALLS

Increased wall insulation keeps the sun's heat out of your home during hot summer months and warm air in during winter months, improving comfort and reducing energy consumption.



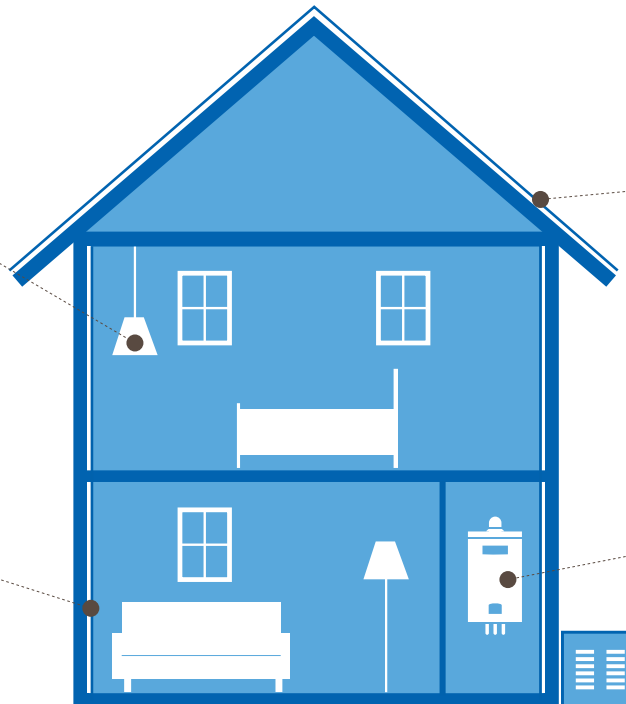
HIGH PERFORMANCE ATTICS

Attics with additional insulation at the roof deck keep attic temperatures closer to ambient, improving the home's heating and cooling performance. Extra insulation at the roof deck, in addition to the ceiling insulation, will reduce the attic temperature by 35 degrees or more during hot summer days.



IMPROVED WATER HEATING SYSTEM EFFICIENCY

Installing tankless water heating technology and better distribution systems reduces the energy needed to provide hot water to the home by about 35 percent.

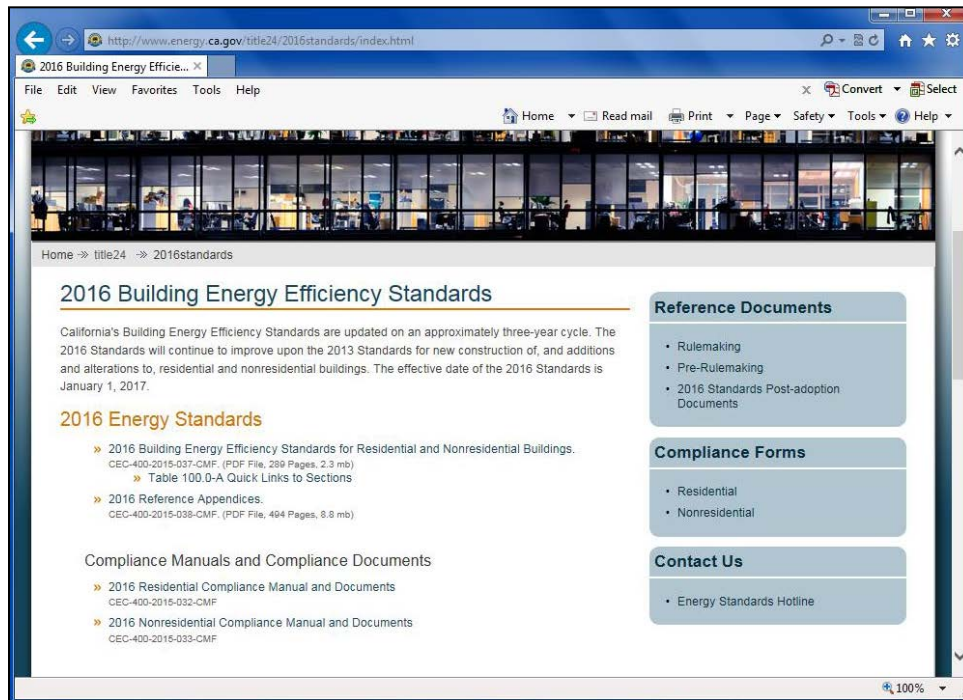


These are cost effective measures that home builders may consider to achieve new levels of efficiency. They can be traded for other efficient technologies such as higher efficiency HVAC units, higher efficiency water heaters, etc.



2016 Documents

- Building Energy Efficiency Standards
- Residential Compliance Manual
- Reference Appendices
- All documents available online at:



<http://www.energy.ca.gov/title24/>



2016 Documents *cont.*

- **Easy Navigation Features Added**
 - Section and Table references hyperlinked throughout Energy Standards
 - TABLE 100.0-A separated with section hyperlinks
 - Chapter hyperlinks in Residential Compliance Manual
 - Links work both online and in the downloaded version

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Nonresidential, High-Rise Residential, And Hotels/Motels	General	120.0	140.0, 140.2	140.0, 140.1	141.0
	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3		
	Envelope (unconditioned process spaces)	N.A.	140.3(c)		
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4		
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5		
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.	141.0 141.0(a)
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7		
	Electrical Power Distribution	110.11, 130.5	N.A.		
	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N. A.		
	Solar Ready Buildings	110.10	N.A.		
Covered Processes ¹	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9
Signs	Indoor and Outdoor	130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H
Low-Rise Residential	General	150.0	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g)			
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)			
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)			
	Outdoor Lighting	110.9, 130.0, 150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N. A.	N.A.	150.2(a), 150.2(b)
	Solar Ready Buildings	110.10	N. A.	N.A.	N.A.
¹ Nonresidential, high-rise and hotel/motel buildings that contain covered processes may conform to the applicable requirements of both occupancy types listed in this table.					



What the future holds

- AB 32 – Reduce carbon footprint
- CPUC/CEC Strategic Plan:
 - Zero net energy goals for residential buildings by 2020
 - Zero net energy goals for nonresidential buildings by 2030
- SB 350 – Double efficiency and renewable energy

Energy Standards will “evolve and expand” and become more stringent to reach these goals



Let's start with some Energy Standards Basics - 101



Navigating The Energy Standards

TITLE 24 - THE CALIFORNIA BUILDING STANDARDS CODE

- **Part 6 (Energy Code)**
 - Subchapters 1 through 9
 - Mostly referred to by Section #'s
 - These are technical requirements
- **Part 1 (Administrative Code)**
 - Chapter 10: administrative requirements





Part 1 Section Numbers

- 10-101 – Scope
- 10-102 – Definitions
- 10-103 – Requirements for Designers, Enforcement...
- 10-103.1 – Lighting ATTCP
- 10-103.2 – Mech. ATTCP
- 10-104 – Exceptional Designs
- 10-105 – CEC Enforcement
- 10-106 – Local Standards
- 10-107 – Interpretations
- 10-108 – Exemption
- 10-109 – Software and Registries
- 10-110 – Application Procedures
- 10-111 – Fenestration
- 10-112 – Default Tables
- 10-113 – Roofing Products
- 10-114 – Out. Lighting Zones



Part 6 Sections for Residential

TABLE 100.0-A APPLICATION OF STANDARDS

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations	
General Provisions for All Buildings						
Nonresidential, High-Rise Residential, And Hotels/Motels	General	120.0	140.0, 140.2	140.0, 140.1	141.0	
	Envelope (conditioned)	110.6, 110.7, 110.8, 120.7	140.3			
	Envelope (unconditioned process spaces)	N.A.	140.3(c)			
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4			
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5			
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6	N.A.		
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6			
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7			
	Electrical Power Distribution	110.11, 130.5	N.A.			
	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N.A.	141.0		
	Solar Ready Buildings	110.10	N.A.	141.0(a)		
Covered Processes ¹	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9	
Signs	Indoor and Outdoor	130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H	
Low-Rise Residential	General	150.0	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)	
	Envelope (conditioned)	110.6, 110.7, 110.8, 150.0(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g)				
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(e)				
	Water Heating	110.3, 150.0(j, n)				
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)				
	Outdoor Lighting	110.9, 130.0, 150.0(k)				
	Pool and Spa Systems	110.4, 150.0(p)	N.A.	N.A.	150.2(a), 150.2(b)	
	Solar Ready Buildings	110.10	N.A.	N.A.	N.A.	

¹ Nonresidential, high-rise and hotel/motel buildings that contain covered processes may conform to the applicable requirements of both occupancy types listed in this table.

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- **§110.0 – 110.10 as applicable**
 - Cover both residential and nonresidential
- **§150.0 for residential mandatory measures**
- **§150.1 for ALL prescriptive requirements**
 - Newly constructed buildings
- **§150.2 for additions and alterations**



Mandatory Measures

- Must always be met and installed
- Establish minimum level of energy efficiency and/or performance
- Apply to various building components
- Sometimes are superseded by more stringent prescriptive or performance requirements
- Located in §150.0



Mandatory Measures Summary

- 2016 update available now
- Not a form – note block
- Summary of residential mandatory measures
- Designers can choose to include on plans
- Enforcement agencies may require on plans



2016 Low-Rise Residential Mandatory Measures Summary

*NOTE: Low-rise residential buildings subject to the Energy Standards must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information. *Exceptions may apply.
(Original 08/2016)*

Building Envelope Measures:	
§ 110.6(a)1:	Air Leakage. Manufactured fenestration, exterior doors, and exterior pet doors must limit air leakage to 0.3 cfm/ft ² or less when tested per NFRC-400 or ASTM E-283 or AIAA/MCA/CSA 101 (A.S. 2/14/4-2011)*.
§ 110.6(a)5:	Labeling. Fenestration products must have a label meeting the requirements of § 10-111(a).
§ 110.6(b):	Field fabricated exterior doors and fenestration products must use U-factors and SHGC values from TABLES 110.6-A and 110.6-B for compliance and must be caulked and/or weatherstripped.*
§ 110.7:	Air Leakage. All joints, penetrations and other openings in the building envelope that are potential sources of air leakage must be caulked, gasketed, or weather stripped.
§ 110.8(a):	Insulation Certification by Manufacturers. Insulation specified or installed must meet Standards for Insulating Material.
§ 110.8(b):	Insulation Requirements for Heated Slab Floors. Heated slab floors must be insulated per the requirements of § 110.8(g).
§ 110.8(j):	Roofing Products Solar Reflectance and Thermal Emittance. The thermal emittance and aged solar reflectance values of the roofing material must meet the requirements of § 110.8(j) when the installation of a cool roof is specified on the CFI.
§ 110.9(a):	Radiant Barriers. A radiant barrier must have an emittance of 0.05 or less and be certified to the Department of Consumer Affairs.
§ 150.0(a):	Ceiling and Rafter Insulation. Minimum R-22 insulation in wood frame ceiling, or the weighted average U-factor must not exceed 0.043. Minimum R-19 or weighted average U-factor of 0.054 or less in a rafter roof alteration. Attic access doors must have permanently attached insulation using adhesive or mechanical fasteners. The attic access must be gasketed to prevent air leakage. Insulation must be installed in direct contact with a continuous roof or ceiling which is sealed to limit infiltration and exfiltration as specified in § 110.7, including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling.*
§ 150.0(b):	Loose-fill Insulation. Loose-fill insulation must meet the manufacturer's required density for the labeled R-value.
§ 150.0(c):	Wall Insulation. Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less (R-19 in 2x6 or U-factor of 0.074 or less). Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102, equivalent to an installed value of R-13 in a wood framed assembly.*
§ 150.0(d):	Insulated Floor Insulation. Minimum R-19 insulation in raised wood framed floor or 0.037 minimum U-factor.*
§ 150.0(f):	Slab Edge Insulation. Slab edge insulation must meet all of the following: have a water absorption rate, for the insulation material alone without facings, no greater than 0.3%; have a water vapor permeance no greater than 2.0 perm-inch; be protected from physical damage and UV light deterioration; and, when installed as part of a heated slab floor, meet the requirements of § 110.8(g).
§ 150.0(g)1:	Vapor Retarder. In Climate Zones 1-16, the earth floor of unvented crawl space must be covered with a Class I or Class II vapor retarder. This requirement also applies to controlled ventilation crawl spaces for buildings complying with the exception to § 150.0(d).
§ 150.0(g)2:	Vapor Retarder. In Climate Zones 14 and 16, a Class I or Class II vapor retarder must be installed on the conditioned space side of all insulation in all exterior walls, vented attics and unvented attics with air-permeable insulation.
§ 150.0(h):	Fenestration Products. Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors must have a minimum U-factor of 0.58, or the weighted average U-factor of all fenestration must not exceed 0.58.*
Fireplaces, Decorative Gas Appliances and Gas Log Measures:	
§ 150.0(j)1A:	Closable Doors. Masonry or factory-built fireplaces must have a closable metal or glass door covering the entire opening of the fireplace.
§ 150.0(j)1B:	Combustion Intake. Masonry or factory-built fireplaces must have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper or a combustion-air control device.*
§ 150.0(j)1C:	Flue Damper. Masonry or factory-built fireplaces must have a flue damper with a readily accessible control.*
§ 150.0(j)2:	Pilot Light. Continuous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.
Space Conditioning, Water Heating and Plumbing System Measures:	
§ 110.2(a) § 110.3:	Certification. HVAC equipment, water heaters, showerheads, faucets and all other regulated appliances must be certified by the manufacturer, to the Energy Commission*.
§ 110.2(a):	HVAC Efficiency. Equipment must meet the applicable efficiency requirements in TABLE 110.2-A through TABLE 110.2-K.*
§ 110.2(b):	Controls for Heat Pumps with Supplementary Electric Resistance Heaters. Heat pumps with supplementary electric resistance heaters must have controls that prevent supplementary heater operation when the heating load can be met by the heat pump alone, and in which the cut-on temperature for compression heating is higher than the cut-off temperature for supplementary heating, and the cut-off temperature for compression heating is higher than the cut-off temperature for supplementary heating.*
§ 110.2(c):	Thermostats. All unitary heating or cooling systems not controlled by a central energy management control system (EMCS) must have a setback thermostat.*
§ 110.3(j)5:	Water Heating Recirculation Loops Serving Multiple Dwelling Units. Water heating recirculation loops serving multiple dwelling units must meet the air release valve, backflow prevention, pump priming, pump isolation valve, and recirculation loop connection requirements of § 110.3(j)5.
§ 110.3(j)7:	Isolation Valves. Instantaneous water heaters with an input rating greater than 6.6 Btu/hr (2 kW) must have isolation valves with hose bibbs or other fittings on both cold water and hot water lines of water heating systems to allow for water tank flushing when the valves are closed.
§ 110.5:	Pilot Lights. Continuously burning pilot lights are prohibited for natural gas, fan-type central furnaces, household cooking appliances (appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu/hr are exempt), and pool and spa heaters*.
§ 150.0(i)1:	Building Cooling and Heating Loads. Heating and/or cooling loads are calculated in accordance with ASHRAE Handbook, Equipment Sizing, Application Volume, and Fundamentals Volume, and SMACNA Residential Comfort System Installation Standards Manual, or ACCA Manual J using design conditions specified in § 150.0(h)2.



2016 Low-Rise Residential Mandatory Measures Summary

*NOTE: Low-rise residential buildings subject to the Energy Standards must comply with all applicable mandatory measures, regardless of the compliance approach used. Review the respective section for more information. *Exceptions may apply.
(Original 08/2016)*

Building Envelope Measures:	
§ 110.6(a)1:	Air Leakage. Manufactured fenestration, exterior doors, and exterior pet doors must limit air leakage to 0.3 cfm/ft ² or less when tested per NFRC-400 or ASTM E283 or AAMA/WDMA/CSA 101/I.S.2/A440-2011.*
§ 110.6(a)5:	Labeling. Fenestration products must have a label meeting the requirements of § 10-111(a).
§ 110.6(b):	Field fabricated exterior doors and fenestration products must use U-factors and solar heat gain coefficient (SHGC) values from TABLES 110.6-A and 110.6-B for compliance and must be caulked and/or weatherstripped.*
§ 110.7:	Air Leakage. All joints, penetrations, and other openings in the building envelope that are potential sources of air leakage must be caulked, gasketed, or weather stripped.
§ 110.8(a):	Insulation Certification by Manufacturers. Insulation specified or installed must meet Standards for Insulating Material.
§ 110.8(g):	Insulation Requirements for Heated Slab Floors. Heated slab floors must be insulated per the requirements of § 110.8(g).
§ 110.8(i):	Roofing Products Solar Reflectance and Thermal Emittance. The thermal emittance and aged solar reflectance values of the roofing material must meet the requirements of § 110.8(i) when the installation of a cool roof is specified on the CF1R.
§ 110.8(j):	Radiant Barrier. A radiant barrier must have an emittance of 0.05 or less and be certified to the Department of Consumer Affairs.
§ 150.0(a):	Ceiling and Rafter Roof Insulation. Minimum R-22 insulation in wood-frame ceiling; or the weighted average U-factor must not exceed 0.043. Minimum R-19 or weighted average U-factor of 0.054 or less in a rafter roof alteration. Attic access doors must have permanently attached insulation using adhesive or mechanical fasteners. The attic access must be gasketed to prevent air leakage. Insulation must be installed in direct contact with a continuous roof or ceiling which is sealed to limit infiltration and exfiltration as specified in § 110.7, including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling.*
§ 150.0(b):	Loose-fill Insulation. Loose fill insulation must meet the manufacturer's required density for the labeled R-value.
§ 150.0(c):	Wall Insulation. Minimum R-13 insulation in 2x4 inch wood framing wall or have a U-factor of 0.102 or less (R-19 in 2x6 or U-factor of 0.074 or less). Opaque non-framed assemblies must have an overall assembly U-factor not exceeding 0.102, equivalent to an installed value of R-13 in a wood framed assembly.*
§ 150.0(d):	Raised-floor Insulation. Minimum R-19 insulation in raised wood framed floor or 0.037 maximum U-factor.*
§ 150.0(f):	Slab Edge Insulation. Slab edge insulation must meet all of the following: have a water absorption rate, for the insulation material alone without facings, no greater than 0.3%; have a water vapor permeance no greater than 2.0 perm/inch; be protected from physical damage and UV light deterioration; and, when installed as part of a heated slab floor, meet the requirements of § 110.8(g).
§ 150.0(g)1:	Vapor Retarder. In Climate Zones 1-16, the earth floor of unvented crawl space must be covered with a Class I or Class II vapor retarder. This requirement also applies to controlled ventilation crawl space for buildings complying with the exception to § 150.0(d).
§ 150.0(g)2:	Vapor Retarder. In Climate Zones 14 and 16, a Class I or Class II vapor retarder must be installed on the conditioned space side of all insulation in all exterior walls, vented attics, and unvented attics with air-permeable insulation.
§ 150.0(q):	Fenestration Products. Fenestration, including skylights, separating conditioned space from unconditioned space or outdoors must have a maximum U-factor of 0.58; or the weighted average U-factor of all fenestration must not exceed 0.58.*
Fireplaces, Decorative Gas Appliances, and Gas Log Measures:	
§ 150.0(e)1A:	Closable Doors. Masonry or factory-built fireplaces must have a closable metal or glass door covering the entire opening of the firebox.
§ 150.0(e)1B:	Combustion Intake. Masonry or factory-built fireplaces must have a combustion outside air intake, which is at least six square inches in area and is equipped with a readily accessible, operable, and tight-fitting damper or combustion-air control device.*
§ 150.0(e)1C:	Flue Damper. Masonry or factory-built fireplaces must have a flue damper with a readily accessible control.*
§ 150.0(e)2:	Pilot Light. Continuous burning pilot lights and the use of indoor air for cooling a firebox jacket, when that indoor air is vented to the outside of the building, are prohibited.
Space Conditioning, Water Heating, and Plumbing System Measures:	
§ 110.0-§ 110.3:	Certification. Heating, ventilation and air conditioning (HVAC) equipment, water heaters, showerheads, faucets, and all other regulated appliances must be certified by the manufacturer to the Energy Commission.*
§ 110.2(a):	HVAC Efficiency. Equipment must meet the applicable efficiency requirements in TABLE 110.2-A through TABLE 110.2-K.*
§ 110.2(b):	Controls for Heat Pumps with Supplementary Electric Resistance Heaters. Heat pumps with supplementary electric resistance heaters must have controls that prevent supplementary heater operation when the heating load can be met by the heat pump alone; and in which the cut-on temperature for compression heating is higher than the cut-on temperature for supplementary heating, and the cut-off temperature for compression heating is higher than the cut-off temperature for supplementary heating.*
§ 110.2(c):	Thermostats. All unitary heating or cooling systems not controlled by a central energy management control system (EMCS) must have a setback thermostat.*
§ 110.3(c)5:	Water Heating Recirculation Loops Serving Multiple Dwelling Units. Water heating recirculation loops serving multiple dwelling units must meet the air release valve, backflow prevention, pump priming, pump isolation valve, and recirculation loop connection requirements of § 110.3(c)5.
§ 110.3(c)7:	Isolation Valves. Instantaneous water heaters with an input rating greater than 6.8 kBtu/hr (2 kW) must have isolation valves with hose bibbs or other fittings on both cold water and hot water lines of water heating systems to allow for water tank flushing when the valves are closed.
§ 110.5:	Pilot Lights. Continuously burning pilot lights are prohibited for natural gas: fan-type central furnaces; household cooking appliances (appliances without an electrical supply voltage connection with pilot lights that consume less than 150 Btu/hr are exempt); and pool and spa heaters.*
§ 150.0(h)1:	Building Cooling and Heating Loads. Heating and/or cooling loads are calculated in accordance with ASHRAE Handbook, Equipment Volume, Applications Volume, and Fundamentals Volume; SMACNA Residential Comfort System Installation Standards Manual; or ACCA Manual J using design conditions specified in § 150.0(h)2.



2016 Low-Rise Residential Mandatory Measures Summary

§ 150.0(h)3A:	Clearances. Installed air conditioner and heat pump outdoor condensing units must have a clearance of at least 5 feet from the outlet of any dryer vent.
§ 150.0(h)3B:	Liquid Line Drier. Installed air conditioner and heat pump systems must be equipped with liquid line filter driers if required, as specified by manufacturer's instructions.
§ 150.0(j)1:	Storage Tank Insulation. Unfired hot water tanks, such as storage tanks and backup storage tanks for solar water-heating systems, must have R-12 external insulation or R-16 internal insulation where the internal insulation R-value is indicated on the exterior of the tank.
§ 150.0(j)2A:	Water piping and cooling system line insulation. For domestic hot water system piping, whether buried or unburied, all of the following must be insulated according to the requirements of TABLE 120.3-A: the first 5 feet of hot and cold water pipes from the storage tank; all piping with a nominal diameter of 3/4 inch or larger; all piping associated with a domestic hot water recirculation system regardless of the pipe diameter; piping from the heating source to storage tank or between tanks; piping buried below grade; and all hot water pipes from the heating source to kitchen fixtures.*
§ 150.0(j)2B:	Water piping and cooling system line insulation. All domestic hot water pipes that are buried below grade must be installed in a water proof and non-crushable casing or sleeve.*
§ 150.0(j)2C:	Water piping and cooling system line insulation. Pipe for cooling system lines must be insulated as specified in § 150.0(j)2A. Distribution piping for steam and hydronic heating systems or hot water systems must meet the requirements in TABLE 120.3-A.*
§ 150.0(j)3:	Insulation Protection. Insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind.
§ 150.0(j)3A:	Insulation Protection. Insulation exposed to weather must be installed with a cover suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. The cover must be water retardant and provide shielding from solar radiation that can cause degradation of the material.
§ 150.0(j)3B:	Insulation Protection. Insulation covering chilled water piping and refrigerant suction piping located outside the conditioned space must have a Class I or Class II vapor retarder.
§ 150.0(n)1:	Gas or Propane Systems. Systems using gas or propane water heaters to serve individual dwelling units must include all of the following: a 120V electrical receptacle within 3 feet of the water heater; a Category III or IV vent, or a Type B vent with straight pipe between the outside termination and the space where the water heater is installed; a condensate drain that is no more than 2 inches higher than the base of the water heater, and allows natural draining without pump assistance; and a gas supply line with a capacity of at least 200,000 Btu/hr.
§ 150.0(n)2:	Recirculating Loops. Recirculating loops serving multiple dwelling units must meet the requirements of § 110.3(c)5.
§ 150.0(n)3:	Solar Water-heating Systems. Solar water-heating systems and collectors must be certified and rated by the Solar Rating and Certification Corporation (SRCC) or by a listing agency that is approved by the Executive Director.
Ducts and Fans Measures:	
§ 110.8(d)3:	Ducts. Insulation installed on an existing space-conditioning duct must comply with § 604.0 of the California Mechanical Code (CMC). If a contractor installs the insulation, the contractor must certify to the customer, in writing, that the insulation meets this requirement.
§ 150.0(m)1:	CMC Compliance. All air-distribution system ducts and plenums must be installed, sealed, and insulated to meet the requirements of CMC §§ 601.0, 602.0, 603.0, 604.0, 605.0 and ANSI/SMACNA-006-2006 HVAC Duct Construction Standards Metal and Flexible 3rd Edition. Portions of supply-air and return-air ducts and plenums must be insulated to a minimum installed level of R-6.0 (or higher if required by CMC § 605.0) or a minimum installed level of R-4.2 when entirely in conditioned space as confirmed through field verification and diagnostic testing (RA3.1.4.3.8). Connections of metal ducts and inner core of flexible ducts must be mechanically fastened. Openings must be sealed with mastic, tape, or other duct-closure system that meets the applicable requirements of UL 181, UL 181A, or UL 181B or aerosol sealant that meets the requirements of UL 723. If mastic or tape is used to seal openings greater than 1/4 inch, the combination of mastic and either mesh or tape must be used. Building cavities, support platforms for air handlers, and plenums designed or constructed with materials other than sealed sheet metal, duct board or flexible duct must not be used for conveying conditioned air. Building cavities and support platforms may contain ducts. Ducts installed in cavities and support platforms must not be compressed to cause reductions in the cross-sectional area of the ducts.*
§ 150.0(m)2:	Factory-Fabricated Duct Systems. Factory-fabricated duct systems must comply with applicable requirements for duct construction, connections, and closures; joints and seams of duct systems and their components must not be sealed with cloth back rubber adhesive duct tapes unless such tape is used in combination with mastic and draw bands.
§ 150.0(m)3:	Field-Fabricated Duct Systems. Field-fabricated duct systems must comply with applicable requirements for: pressure-sensitive tapes, mastics, sealants, and other requirements specified for duct construction.
§ 150.0(m)7:	Backdraft Dampers. All fan systems that exchange air between the conditioned space and the outside of the building must have backdraft or automatic dampers.
§ 150.0(m)8:	Gravity Ventilation Dampers. Gravity ventilating systems serving conditioned space must have either automatic or readily accessible, manually operated dampers in all openings to the outside, except combustion inlet and outlet air openings and elevator shaft vents.
§ 150.0(m)9:	Protection of Insulation. Insulation must be protected from damage, including that due to sunlight, moisture, equipment maintenance, and wind. Insulation exposed to weather must be suitable for outdoor service. For example, protected by aluminum, sheet metal, painted canvas, or plastic cover. Cellular foam insulation must be protected as above or painted with a coating that is water retardant and provides shielding from solar radiation.
§ 150.0(m)10:	Porous Inner Core Flex Duct. Porous inner core flex duct must have a non-porous layer between the inner core and outer vapor barrier.
§ 150.0(m)11:	Duct System Sealing and Leakage Test. When space conditioning systems use forced air duct systems to supply conditioned air to an occupiable space, the ducts must be sealed and duct leakage tested, as confirmed through field verification and diagnostic testing, in accordance with § 150.0(m)11 and Reference Residential Appendix RA3.
§ 150.0(m)12:	Air Filtration. Mechanical systems that supply air to an occupiable space through ductwork exceeding 10 feet in length and through a thermal conditioning component, except evaporative coolers, must be provided with air filter devices that meet the design, installation, efficiency, pressure drop, and labeling requirements of § 150.0(m)12.



2016 Low-Rise Residential Mandatory Measures Summary

§ 150.0(m)13:	Duct System Sizing and Air Filter Grille Sizing. Space conditioning systems that use forced air ducts to supply cooling to an occupiable space must have a hole for the placement of a static pressure probe (HSPP), or a permanently installed static pressure probe (PSPP) in the supply plenum. The space conditioning system must also demonstrate airflow ≥ 350 CFM per ton of nominal cooling capacity through the return grilles, and an air-handling unit fan efficacy ≤ 0.58 W/CFM as confirmed by field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.3. This applies to both single zone central forced air systems and every zone for zonally controlled central forced air systems.*
§150.0(o):	Ventilation for Indoor Air Quality. All dwelling units must meet the requirements of ASHRAE Standard 62.2. Neither window operation nor continuous operation of central forced air system air handlers used in central fan integrated ventilation systems are permissible methods of providing whole-building ventilation.
§ 150.0(o)1A:	Field Verification and Diagnostic Testing. Whole-building ventilation airflow must be confirmed through field verification and diagnostic testing, in accordance with Reference Residential Appendix RA3.7.
Pool and Spa Systems and Equipment Measures:	
§ 110.4(a):	Certification by Manufacturers. Any pool or spa heating system or equipment must be certified to have all of the following: a thermal efficiency that complies with the Appliance Efficiency Regulations; an on-off switch mounted outside of the heater that allows shutting off the heater without adjusting the thermostat setting; a permanent weatherproof plate or card with operating instructions; and must not use electric resistance heating.*
§ 110.4(b)1:	Piping. Any pool or spa heating equipment must be installed with at least 36 inches of pipe between the filter and the heater, or dedicated suction and return lines, or built-in or built-up connections to allow for future solar heating.
§ 110.4(b)2:	Covers. Outdoor pools or spas that have a heat pump or gas heater must have a cover.
§ 110.4(b)3:	Directional inlets and time switches for pools. Pools must have directional inlets that adequately mix the pool water, and a time switch that will allow all pumps to be set or programmed to run only during off-peak electric demand periods.
§ 110.5:	Pilot Light. Natural gas pool and spa heaters must not have a continuously burning pilot light.
§ 150.0(p):	Pool Systems and Equipment Installation. Residential pool systems or equipment must meet the specified requirements for pump sizing, flow rate, piping, filters, and valves.*
Lighting Measures:	
§ 110.9:	Lighting Controls and Components. All lighting control devices and systems, ballasts, and luminaires must meet the applicable requirements of § 110.9.*
§ 110.9(e):	JA8 High Efficacy Light Sources. To qualify as a JA8 high efficacy light source for compliance with § 150.0(k), a residential light source must be certified to the Energy Commission according to Reference Joint Appendix JA8.
§ 150.0(k)1A:	Luminaire Efficacy. All installed luminaires must be high efficacy in accordance with TABLE 150.0-A.
§ 150.0(k)1B:	Blank Electrical Boxes. The number of electrical boxes that are more than 5 feet above the finished floor and do not contain a luminaire or other device must be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control.
§ 150.0(k)1C:	Recessed Downlight Luminaires in Ceilings. Luminaires recessed into ceilings must meet all of the requirements for: insulation contact (IC) labeling; air leakage; sealing; maintenance; and socket and light source as described in § 150.0(k)1C. A JA8-2016-E light source rated for elevated temperature must be installed by final inspection in all recessed downlight luminaires in ceilings.
§ 150.0(k)1D:	Electronic Ballasts. Ballasts for fluorescent lamps rated 13 watts or greater must be electronic and must have an output frequency no less than 20 kHz.
§ 150.0(k)1E:	Night Lights. Permanently installed night lights and night lights integral to installed luminaires or exhaust fans must be rated to consume no more than 5 watts of power per luminaire or exhaust fan as determined in accordance with § 130.0(c). Night lights do not need to be controlled by vacancy sensors.
§ 150.0(k)1F:	Lighting Integral to Exhaust Fans. Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) must meet the applicable requirements of § 150.0(k).*
§ 150.0(k)1G:	Screw based luminaires. Screw based luminaires must not be recessed downlight luminaires in ceilings and must contain lamps that comply with Reference Joint Appendix JA8. Installed lamps must be marked with "JA8-2016" or "JA8-2016-E" as specified in Reference Joint Appendix JA8.*
§ 150.0(k)1H:	Enclosed Luminaires. Light sources installed in enclosed luminaires must be JA8 compliant and must be marked with "JA8-2016-E."
§ 150.0(k)2A:	Interior Switches and Controls. All forward phase cut dimmers used with LED light sources must comply with NEMA SSL 7A.
§ 150.0(k)2B:	Interior Switches and Controls. Exhaust fans must be switched separately from lighting systems.*
§ 150.0(k)2C:	Interior Switches and Controls. Luminaires must be switched with readily accessible controls that permit the luminaires to be manually switched ON and OFF.
§ 150.0(k)2D:	Interior Switches and Controls. Controls and equipment must be installed in accordance with manufacturer's instructions.
§ 150.0(k)2E:	Interior Switches and Controls. No control must bypass a dimmer or vacancy sensor function if the control is installed to comply with § 150.0(k).
§ 150.0(k)2F:	Interior Switches and Controls. Lighting controls must comply with the applicable requirements of § 110.9.
§ 150.0(k)2G:	Interior Switches and Controls. An energy management control system (EMCS) may be used to comply with dimmer requirements if it: functions as a dimmer according to § 110.9; meets the Installation Certificate requirements of § 130.4; meets the EMCS requirements of § 130.5(f); and meets all other requirements in § 150.0(k)2.
§ 150.0(k)2H:	Interior Switches and Controls. An EMCS may be used to comply with vacancy sensor requirements in § 150.0(k) if it meets all of the following: it functions as a vacancy sensor according to § 110.9; the Installation Certificate requirements of § 130.4; the EMCS requirements of § 130.5(f); and all other requirements in § 150.0(k)2.
§ 150.0(k)2I:	Interior Switches and Controls. A multiscene programmable controller may be used to comply with dimmer requirements in § 150.0(k) if it provides the functionality of a dimmer according to § 110.9, and complies with all other applicable requirements in § 150.0(k)2.



2016 Low-Rise Residential Mandatory Measures Summary

§ 150.0(k)2J:	Interior Switches and Controls. In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces must be controlled by a vacancy sensor.
§ 150.0(k)2K:	Interior Switches and Controls. Dimmers or vacancy sensors must control all luminaires required to have light sources compliant with Reference Joint Appendix JA8, except luminaires in closets less than 70 square feet and luminaires in hallways.*
§ 150.0(k)2L:	Interior Switches and Controls. Undercabinet lighting must be switched separately from other lighting systems.
§ 150.0(k)3A:	Residential Outdoor Lighting. For single-family residential buildings, outdoor lighting permanently mounted to a residential building, or to other buildings on the same lot, must meet the requirement in item § 150.0(k)3Ai (ON and OFF switch) and the requirements in either item § 150.0(k)3Aii (photocell and motion sensor) or item § 150.0(k)3Aiii (photo control and automatic time switch control, astronomical time clock, or EMCS).
§ 150.0(k)3B:	Residential Outdoor Lighting. For low-rise multifamily residential buildings, outdoor lighting for private patios, entrances, balconies, and porches; and outdoor lighting for residential parking lots and residential carports with less than eight vehicles per site must comply with either § 150.0(k)3A or with the applicable requirements in §§ 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)3C:	Residential Outdoor Lighting. For low-rise residential buildings with four or more dwelling units, outdoor lighting not regulated by § 150.0(k)3B or § 150.0(k)3D must comply with the applicable requirements in §§ 110.9, 130.0, 130.2, 130.4, 140.7 and 141.0.
§ 150.0(k)3D:	Residential Outdoor Lighting. Outdoor lighting for residential parking lots and residential carports with a total of eight or more vehicles per site must comply with the applicable requirements in §§ 110.9, 130.0, 130.2, 130.4, 140.7, and 141.0.
§ 150.0(k)4:	Internally illuminated address signs. Internally illuminated address signs must comply with § 140.8; or must consume no more than 5 watts of power as determined according to § 130.0(c).
§ 150.0(k)5:	Residential Garages for Eight or More Vehicles. Lighting for residential parking garages for eight or more vehicles must comply with the applicable requirements for nonresidential garages in §§ 110.9, 130.0, 130.1, 130.4, 140.6, and 141.0.
§ 150.0(k)6A:	Interior Common Areas of Low-rise Multi-Family Residential Buildings. In a low-rise multifamily residential building where the total interior common area in a single building equals 20 percent or less of the floor area, permanently installed lighting for the interior common areas in that building must be high efficacy luminaires and controlled by an occupant sensor.
§ 150.0(k)6B:	Interior Common Areas of Low-rise Multi-Family Residential Buildings. In a low-rise multifamily residential building where the total interior common area in a single building equals more than 20 percent of the floor area, permanently installed lighting in that building must: i. Comply with the applicable requirements in §§ 110.9, 130.0, 130.1, 140.6 and 141.0; and ii. Lighting installed in corridors and stairwells must be controlled by occupant sensors that reduce the lighting power in each space by at least 50 percent. The occupant sensors must be capable of turning the light fully on and off from all designed paths of ingress and egress.
Solar Ready Buildings:	
§ 110.10(a)1:	Single Family Residences. Single family residences located in subdivisions with ten or more single family residences and where the application for a tentative subdivision map for the residences has been deemed complete by the enforcement agency must comply with the requirements of § 110.10(b) through § 110.10(e).
§ 110.10(a)2:	Low-rise Multi-family Buildings. Low-rise multi-family buildings must comply with the requirements of § 110.10(b) through § 110.10(d).
§ 110.10(b)1:	Minimum Area. The solar zone must have a minimum total area as described below. The solar zone must comply with access, pathway, smoke ventilation, and spacing requirements as specified in Title 24, Part 9 or other Parts of Title 24 or in any requirements adopted by a local jurisdiction. The solar zone total area must be comprised of areas that have no dimension less than 5 feet and are no less than 80 square feet each for buildings with roof areas less than or equal to 10,000 square feet or no less than 160 square feet each for buildings with roof areas greater than 10,000 square feet. For single family residences the solar zone must be located on the roof or overhang of the building and have a total area no less than 250 square feet. For low-rise multi-family buildings the solar zone must be located on the roof or overhang of the building, or on the roof or overhang of another structure located within 250 feet of the building, or on covered parking installed with the building project, and have a total area no less than 15 percent of the total roof area of the building excluding any skylight area.*
§ 110.10(b)2:	Orientation. All sections of the solar zone located on steep-sloped roofs must be oriented between 110 degrees and 270 degrees of true north.
§ 110.10(b)3A:	Shading. The solar zone must not contain any obstructions, including but not limited to: vents, chimneys, architectural features, and roof mounted equipment.*
§ 110.10(b)3B:	Shading. Any obstruction located on the roof or any other part of the building that projects above a solar zone must be located at least twice the distance, measured in the horizontal plane, of the height difference between the highest point of the obstruction and the horizontal projection of the nearest point of the solar zone, measured in the vertical plane.*
§ 110.10(b)4:	Structural Design Loads on Construction Documents. For areas of the roof designated as solar zone, the structural design loads for roof dead load and roof live load must be clearly indicated on the construction documents.
§ 110.10(c):	Interconnection Pathways. The construction documents must indicate: a location for inverters and metering equipment and a pathway for routing of conduit from the solar zone to the point of interconnection with the electrical service (for single family residences the point of interconnection will be the main service panel); and a pathway for routing of plumbing from the solar zone to the water-heating system.
§ 110.10(d):	Documentation. A copy of the construction documents or a comparable document indicating the information from § 110.10(b) through § 110.10(c) must be provided to the occupant.
§ 110.10(e)1:	Main Electrical Service Panel. The main electrical service panel must have a minimum busbar rating of 200 amps.
§ 110.10(e)2:	Main Electrical Service Panel. The main electrical service panel must have a reserved space to allow for the installation of a double pole circuit breaker for a future solar electric installation. The reserved space must be: positioned at the opposite (load) end from the input feeder location or main circuit location; and permanently marked as "For Future Solar Electric".



Prescriptive Approach

- Also referred to as Package A
- Set of predefined efficiency requirements that must ALL be met or exceeded
- Applies to various building components
- Simplest approach, but less flexible
- Establishes baseline for Standard home budget under Performance Approach
- Located in §150.1 (TABLE 150.1-A)



Performance Approach

- Also known as the computer method
- Requires the use of Energy Commission approved software
- Most flexible approach, allows for trade-offs
- Proposed energy budget \leq Standard energy budget
- Most applicants use this approach
- Modeling, budgets, assumptions, etc. located in Residential ACM Reference Manual



How To Demonstrate Compliance

- Compliance documents (forms) confirm compliance with the Energy Standards
- Completed by designers, consultants, builders, contractors, HERS raters, etc.
- Submitted to enforcement agencies for verification:
 - Certificate of Compliance (CF1R)
 - Certificate of Installation (CF2R)
 - Certificate of Verification (CF3R)



What is the CF1R?

- **Residential Certificate of Compliance**
- Required with and/or on plans at permit
- Demonstrates compliance at design phase
- Completed by designer, architect, energy consultant, engineer, etc.
- Plans Examiner verifies CF1R matches specs on plans



What is the CF2R?

- **Residential Certificate of Installation**
- Required for Final Inspection
- Confirms compliance at installation
- Completed by builder or installing contractor
- Field Inspector verifies efficiency and components match installed equipment and systems



What is the CF3R?

- **Residential Certificate of Verification**
- Required for Final Inspection
- Confirms compliance with HERS testing requirements at installation (QII and building envelope leakage)
- Completed by certified HERS rater, and forms must be registered with an approved HERS Provider
- Field Inspector verifies testing and forms are completed, signed and registered when required



Where can I find the forms?

Appendix A of the 2016 Residential Compliance Manual

The screenshot shows a web browser window with the URL <http://www.energy.ca.gov/2015publications/CEC-400-2015-032/appendices/forms/>. The page features a large image of wind turbines on a hill. Below the image, the breadcrumb trail reads: Home → 2015publications → CEC-400-2015-032 → appendices → forms. The main heading is "2016 Residential Compliance Manual - Appendix A, Single Forms". A link for "Parent Directory" is provided. A table lists the forms available for download.

Name	last modified <small>Color dates added today</small>	Size
Alterations and Additions Non HERS Verified Forms	Apr 14, 2016	4 kb
CF1R	Apr 14, 2016	4 kb
CF2R	Apr 14, 2016	4 kb
CF3R	Dec 01, 2015	4 kb

<http://www.energy.ca.gov/2015publications/CEC-400-2015-032/appendices/forms/>



Project Summary Form Preview

Project Status Report		CalCERTS, Inc		
		1 of 2		
GENERAL INFORMATION				
Code Year Standards:	2013	 Easy to Verify @ calcerts.com		
Project Name:	Shewmaker Performance Demo			
Project Type:	New Construction SFR			
Address:	1516 9th Street			
City / State / Zip:	Sacramento / CA / 95814			
Enforcement Agency:	City of Sacramento			
Permit Number:	123456789			
HERS VERIFIABLE MEASURES: NOT COMPLETE				
OVERALL STATUS: NOT COMPLETE				
CF1R INFORMATION - Certificate of Compliance ✓				
Certificate Type: Compliance				
Registered Form: CF1R-PHF-01-E				
Registered Date: 04/05/2016 08:30				
Registration Number: 216-N0125429A-00000000-0000				
ADDITIONAL CF1Rs				
System	Form	Registered Date	Registration Number	
	CF1R-SRA-01		216-N0125443A-00000000-0000	●
CF2R INFORMATION - Certificate of Installation				
System	Form	Registered Date	Registration Number	
	CF2R-ENV-01 (Fenestration Installation)		216-N0125429A-E0100001A-0000	●
	CF2R-ENV-02 (Envelope Air Sealing)		216-N0125429A-E0200001A-0000	●
	CF2R-ENV-03 (Insulation Installation)		216-N0125429A-E0300001A-0000	●
	CF2R-ENV-04 (Roofing-Radiant Barrier)		216-N0125429A-E0400001A-0000	●
	CF2R-MCH-01 (Space Conditioning Systems, Ducts and Fans)	04/05/2016 09:40	216-N0125429A-M0100001A-0000	✓
System 1	CF2R-MCH-20 (Duct Leakage)	04/05/2016 09:40	216-N0125429A-M2000002A-0000	✓
System 1	CF2R-MCH-23 (Airflow)	04/05/2016 09:40	216-N0125429A-M2300002A-0000	✓
System 1	CF2R-MCH-22 (Fan Efficacy)	04/05/2016 09:40	216-N0125429A-M2200002A-0000	✓
System 1	CF2R-MCH-25 (Refrigerant Charge)	04/05/2016 09:40	216-N0125429A-M2500002A-0000	✓
	CF2R-MCH-27 (IAQ and MV)	04/05/2016 09:40	216-N0125429A-M2700001A-0000	✓
	CF2R-PLB-02 (SD HWS Distribution)	04/05/2016 09:40	216-N0125429A-P0200003A-0000	✓
CF3R INFORMATION - Certificate of Verification				
System	Form	Registered Date	Registration Number	
	CF3R-MCH-27 (IAQ and MV)		216-N0125429A-M2700001A-M27A	●
System 1	CF3R-MCH-20 (Duct Leakage)	04/11/2016 12:52	216-N0125429A-M2000002A-M20A	✓

CA Building Energy Efficiency Standards 2013 Residential Compliance HERS Provider: CalCERTS Inc. Dec 2015

- Summarizes status of ALL forms
- Available for any project in HERS registry
- Can access directly in registry
- “Overall” and “HERS” should be marked Complete
- Can request a hard copy at Final Inspection to verify compliance

GENERAL INFORMATION

Code Year Standards:	2013	 Easy to Verify @ calcerts.com
Project Name:	Shewmaker Performance Demo	
Project Type:	New Construction SFR	
Address:	1516 9th Street	
City / State / Zip:	Sacramento / CA / 95814	
Enforcement Agency:	City of Sacramento	
Permit Number:	123456789	

HERS VERIFIABLE MEASURES: **NOT COMPLETE**OVERALL STATUS: **NOT COMPLETE**

CF1R INFORMATION - Certificate of Compliance



Certificate Type:	Compliance
Registered Form:	CF1R-PRF-01-E
Registered Date:	04/05/2016 08:30
Registration Number:	216-N0125429A-000000000-0000

ADDITIONAL CF1Rs

System	Form	Registered Date	Registration Number	
	CF1R-SRA-01		216-N0125443A-000000000-0000	●

CF2R INFORMATION - Certificate of Installation

System	Form	Registered Date	Registration Number	
	CF2R-ENV-01 (Fenestration Installation)		216-N0125429A-E0100001A-0000	●
	CF2R-ENV-02 (Envelope Air Sealing)		216-N0125429A-E0200001A-0000	●
	CF2R-ENV-03 (Insulation Installation)		216-N0125429A-E0300001A-0000	●
	CF2R-ENV-04 (Roofing-Radiant Barrier)		216-N0125429A-E0400001A-0000	●
	CF2R-MCH-01 (Space Conditioning Systems, Ducts and Fans)	04/05/2016 09:40	216-N0125429A-M0100001A-0000	✓
System 1	CF2R-MCH-20 (Duct Leakage)	04/05/2016 09:40	216-N0125429A-M2000002A-0000	✓
System 1	CF2R-MCH-23 (Airflow)	04/05/2016 09:40	216-N0125429A-M2300002A-0000	✓
System 1	CF2R-MCH-22 (Fan Efficacy)	04/05/2016 09:40	216-N0125429A-M2200002A-0000	✓
System 1	CF2R-MCH-25 (Refrigerant Charge)	04/05/2016 09:40	216-N0125429A-M2500002A-0000	✓
	CF2R-MCH-27 (IAQ and MV)	04/05/2016 09:40	216-N0125429A-M2700001A-0000	✓
	CF2R-PLB-02 (SD HWS Distribution)	04/05/2016 09:40	216-N0125429A-P0200003A-0000	✓

CF3R INFORMATION - Certificate of Verification

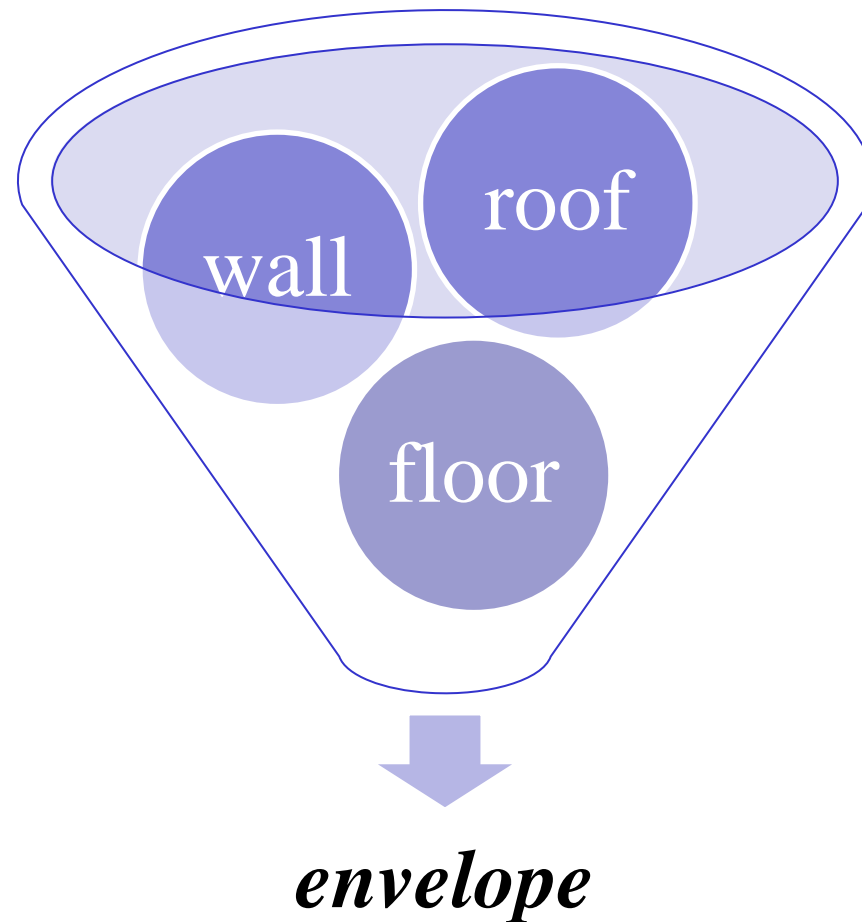
System	Form	Registered Date	Registration Number	
	CF3R-MCH-27 (IAQ and MV)		216-N0125429A-M2700001A-M27A	●
System 1	CF3R-MCH-20 (Duct Leakage)	04/11/2016 12:52	216-N0125429A-M2000002A-M20A	✓



Let's talk about the Building Envelope

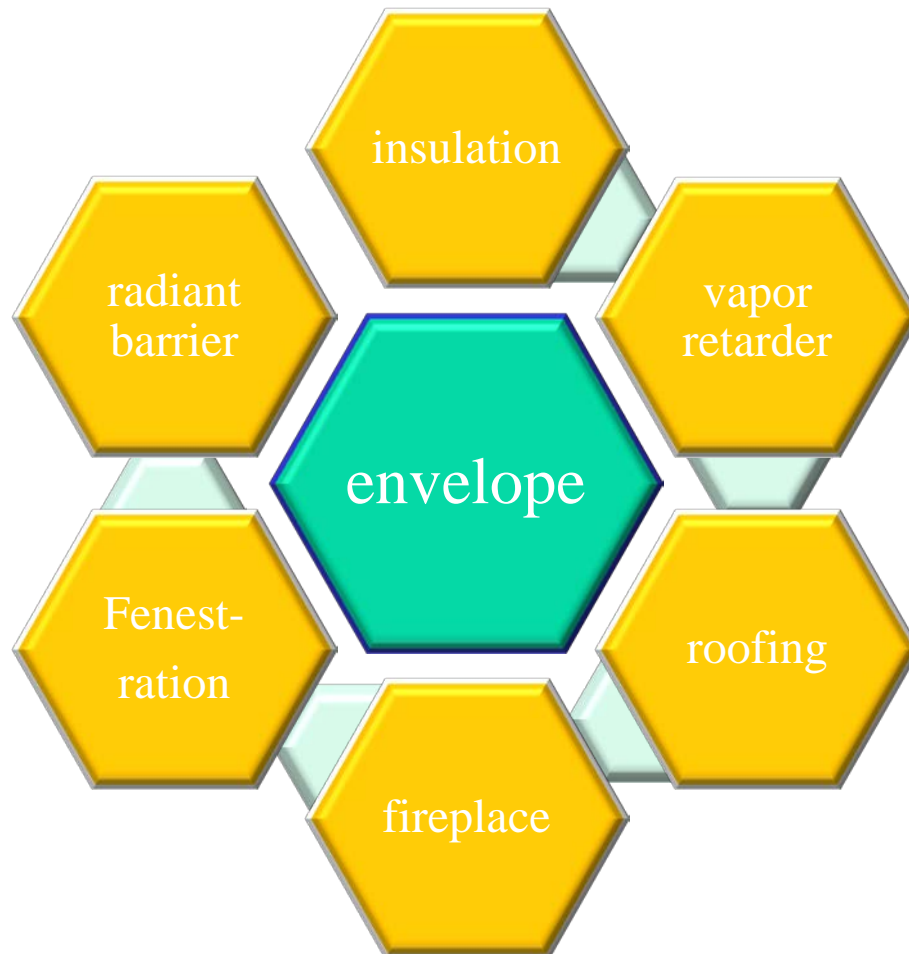


The Big Picture





The Key Elements of *Envelope for energy control*





Building Envelope Background

- Building Envelope Components:
 - ***Envelope*** - Walls, Floor, Roof/ceiling - a “skin” surrounding all six sides
 - ***Fenestration*** - glazed openings (windows, exterior doors with 50% or greater glazed makeup, & skylights)
 - ***Exterior Doors*** - solid or 50% or greater glazed
- Other component terms:
 - *Insulation, cool roof, radiant barrier, vapor retarder*
- Requirements groupings:
 - Administrative, mandatory, prescriptive



*Let's talk about the changes
to the Energy Standards –
Mandatory Measures*



§110.6: Fenestration Labels

- *Fenestration* must meet Heat Loss, Heat Gain, and Leakage requirements
- *Exterior doors* with $\leq 50\%$ glazing need only meet Leakage requirements (outside of the glass area)
- Three types of *fenestration*:
 - **Manufactured** – preassembled glazing & frame
 - Typical window or skylight
 - **Site-Built** – knockdown; fabricated then field-assembled
 - Storefront or curtainwall system
 - **Field-Fabricated** – entirely field-made
 - Custom made at site for a specific application



CALIFORNIA ENERGY COMMISSION

Table 3-1A – Acceptable Methods for Determining U-factor

Fenestration Category					
U-factor Determination Method	Manufactured Windows	Manufactured Skylights	Site-Built Fenestration (Vertical & Skylight)	Field-Fabricated Fenestration	Glass Block
NFRC's Component Modeling Approach (CMA) ¹	✓	✓	✓	N/A	N/A
NFRC-100	✓	✓	✓	N/A	N/A
Standards Default Table 110.6-A	✓	✓	✓	✓	✓
NA6 ²	N/A	N/A	✓	N/A	N/A
<ol style="list-style-type: none"> 1. The NFRC Residential CMA method is an option that may be available during the 2013 cycle of the Energy Standards. 2. The Alternative Default U-factors from Nonresidential Reference Nonresidential Appendix NA6 may only be used for site-built vertical and skylights having less than 1,000ft². 					

**From the
Residential
Compliance
Manual**

Table 3-1B – Methods for Determining Solar Heat Gain Coefficients

Fenestration Category					
SHGC Determination Method	Manufactured Windows	Manufactured Skylights	Site-Built Fenestration (Vertical & Skylight)	Field-Fabricated Fenestration	Glass Block
NFRC's Component Modeling Approach (CMA) ¹	✓	✓	✓	N/A	N/A
NFRC-200	✓	✓	✓	N/A	N/A
Standards Default Table 110.6-B	✓	✓	✓	✓	✓
NA6 ²	N/A	N/A	✓	N/A	N/A
<ol style="list-style-type: none"> 1. The NFRC Residential CMA method is an option that may be available during the 2013 cycle of the Energy Standards. 2. The Alternative Default U-factors from Nonresidential Reference Nonresidential Appendix NA6 may only be used for site-built vertical and skylights having less than 1,000ft². 					



Temporary Labels

 National Fenestration Rating Council® CERTIFIED		World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider	
ENERGY PERFORMANCE RATINGS			
U-Factor (U.S./I-P)		Solar Heat Gain Coefficient	
0.30		0.30	
ADDITIONAL PERFORMANCE RATINGS			
Visible Transmittance		Air Leakage (U.S./I-P)	
0.51		0.2	
<small>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information. www.nfrc.org </small>			

2013 California Energy Commission Default Label XYZ Manufacturing Co.		
Key Features:	<input type="checkbox"/> Doors	<input type="checkbox"/> Double-Pane
	<input type="checkbox"/> Skylight	<input type="checkbox"/> Glass Block
Frame Type	Product Type:	Product Glazing Type:
<input type="checkbox"/> Metal	<input type="checkbox"/> Operable	<input type="checkbox"/> Clear
<input type="checkbox"/> Non-Metal	<input type="checkbox"/> Fixed	<input type="checkbox"/> Tinted
<input type="checkbox"/> Metal, Thermal Break	<input type="checkbox"/> Greenhouse/Garden Window	<input type="checkbox"/> Single-Pane
<input type="checkbox"/> Air space 7/16 in. or greater <input type="checkbox"/> With built-in curb <input type="checkbox"/> Meets Thermal-Break Default Criteria	-----	To calculate VT see NA6
California Energy Commission	California Energy Commission	California Energy Commission
Default U-factor =	Default SHGC =	Calculated VT =
Product meets the air infiltration requirements of §110.6(a)1, U-factor criteria of §110.6(a)2, SHGC criteria of §110.6(a)3 and VT criteria of §110.6(a)4 of the 2013 Building Energy Efficiency Standards for Residential and Nonresidential Buildings.		

Figure 3-2 – Sample of Default Temporary Label



§110.7: Air leakage

- Building envelope
- Objective: to limit infiltration and exfiltration
 - Where: Joints, penetrations, openings
 - How: Gaskets, weather-stripping, or sealant
 - Prefabricated items (like windows) need to be sealed into the envelope
 - Includes things like pipes penetrating a ceiling/attic or garage wall (unconditioned space)





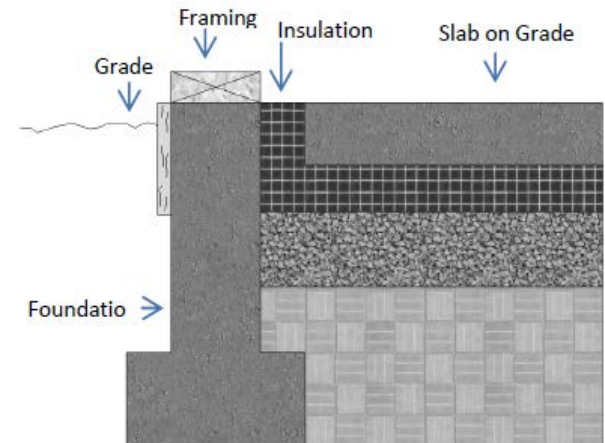
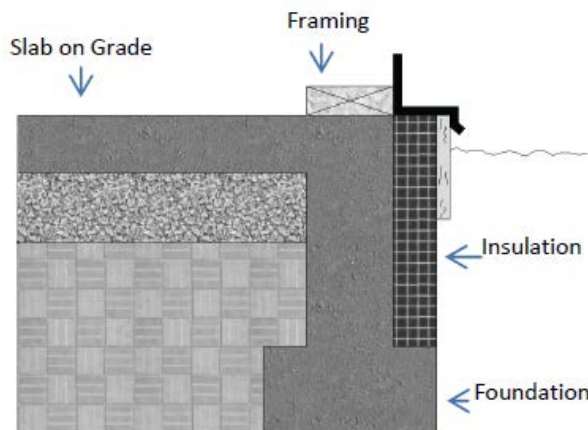
§110.8: Insulation, Roofing, Radiant barrier

- Insulation:
 - Must be certified by Dept. Consumer Affairs and CCR Title 24, Part 12 (a)
 - Placement at ceilings and roof/ceiling assemblies (e)
 - Direct contact with ceiling and/or roof deck
 - Limits if you have suspended ceilings
 - For existing buildings (d)
 - Attic – If insulation added, the resulting total R-value or U-factor to meet §150.0(a). (exceptions apply)



§110.8: Insulation, Roofing, Radiant barrier

- Insulation (cont'd):
 - Heated slab floors (g)
 - Requirements for insulation in direct contact with slab/grade (water absorption and vapor permeance). Install per TABLE 110.8-A
 - Protect exposed material to wind, equipment, moisture, and UV
 - Terminate insulation to block insects from access to structure above foundation





§110.8: Insulation, Roofing, Radiant barrier

- Roofing (i)
 - Products to meet *aged solar reflectance* and *thermal emittance* requirements, when called for by other sections
 - Defined:
 - Reflectance refers to a materials ability to reject solar energy
 - Emittance refers to the ability of heat to escape from a material once solar energy is absorbed
 - Roofing with high reflectance and emittance values are *cool roofs*
 - Certified and labeled per §10-113
 - Exception lists default values for non-certified products
 - *Solar reflectance index* may be used as alternative to SR and TE
 - Liquid-applied roof toppings over roofing are to meet coverage, thickness, and requirements of TABLE 110.8-C





§110.8: Insulation, Roofing, Radiant barrier

- Radiant barrier (j)
 - If required to be installed by other sections:
 - Must meet maximum emittance (0.05)
 - Be tested per ASTM
 - Be certified to CA Department of Consumer Affairs



§150.0(a),(c): Ceiling and Wall Insulation

2013	2016
<ul style="list-style-type: none">• Insulation placement language in §110.8• Roof/ceiling insulation required:<ul style="list-style-type: none">➤ 0.031 maximum U-factor or minimum R-30• Addresses only framed walls	<ul style="list-style-type: none">• Moved to §150.0(a)• Roof/ceiling insulation reduced:<ul style="list-style-type: none">➤ 0.043 maximum U-factor or minimum R-22• Non-framed walls must meet max 0.102 U-factor



§150.0(a),(c): Ceiling and Wall Insulation

- Insulation
 - Ceiling and roof/ceiling assemblies (a)
 - Install minimum R-22 (includes access doors) (exceptions apply), **or**
 - Maximum average assembly U-factor of 0.043
 - Loose fill – install minimum weight/sf, per labeled design R-value
 - Wall assemblies (c)
 - Install R-13 minimum in 2x4 (exception) and R-19 in 2x6 greater framing, **or**
 - Maximum average assembly U-factor of 0.102 for 2x4 wall and 0.074 for 2x6 or greater



§150.0(d),(f): Raised Floor, Slab Edge Insulation

- Insulation (cont'd)
 - Raised floor assemblies (d)
 - Install minimum R-19, **or**
 - Maximum average assembly U-factor of 0.037 (exceptions apply)
 - Slab edges (f)
 - Material meets specification for:
 - ✓ Water absorption
 - ✓ Water vapor permeance
 - ✓ Protection from UV and physical damage



§150.0(a), (c) and the Plans Examiner

- Still verify R-values on CF1R
 - Opaque Surface Const.
 - Must meet or exceed mandatory minimums
- Still verify R-values on building plans
 - Structural/Architectural Plans

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD							CF1R-PRF-01
Project Name: Residential Example				Calculation Date/Time: 08:43, Wed, Dec 23, 2015			Page 5 of 9
Calculation Description: Title 24 Analysis				Input File Name: Res Sample.rbd1dx			
OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Winter Design U-value	Assembly Layers	
Garage Ext Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	none	0.361	• Inside Finish: Gypsum Board • Cavity / Frame: no insul. / 2x4 • Exterior Finish: 3 Coat Stucco	
R-30 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 30	0.032	• Inside Finish: Gypsum Board • Cavity / Frame: R-8.1 / 2x4 • Over Ceiling Joists: R-20.9 insul.	
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)	
Attic Roof1st Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)	
R-38 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 38	0.025	• Inside Finish: Gypsum Board • Cavity / Frame: R-8.1 / 2x4 • Over Ceiling Joists: R-28.9 insul.	
R-19 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O.C.	R 19	0.072	• Inside Finish: Gypsum Board • Cavity / Frame: R-19 / 2x6 • Exterior Finish: 3 Coat Stucco	
R-13 Wall	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	R 13	0.092	• Inside Finish: Gypsum Board • Cavity / Frame: R-13 / 2x4 • Other Side Finish: Gypsum Board	
Attic Roof2nd Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.644	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)	
R-0 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x12 @ 16 in. O.C.	none	0.196	• Floor Surface: Carpeted • Floor Deck: Wood Siding/sheathing/decking • Cavity / Frame: no insul. / 2x12 • Ceiling Below Finish: Gypsum Board	
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O.C.	R 19	0.048	• Floor Surface: Carpeted • Floor Deck: Wood Siding/sheathing/decking • Cavity / Frame: R-19 / 2x6 • Ceiling Below Finish: Gypsum Board	

Registration Number: CA Building Energy Efficiency Standards - 2016 Residential Compliance

Registration Date/Time: RPT Version - CF1R-11192015-401

HERS Provider: RPT Generated at: 2015-12-23 08:44:03



§150.0(a), (c) and the Field Inspector

- **Verify installed R-values:**
 - Still verify ceiling insulation at Final
 - Still verify wall insulation at Insulation Stage (earlier for continuous)
 - Values must meet or exceed mandatory minimums
- **Verify R-values on CF2R-ENV-03-E form**
 - Must be HERS registered





§150.0(g): Vapor Retarder

- Vapor retarder
 - Walls and Attics -- Install Class II on conditioned side in climate zones (CZ) 14 and 16 of
 - exterior wall insulation
 - vented attics
 - unvented attics having air-permeable insulation
 - Underfloor crawlspaces in all CZs
 - Install Class I or II on grade for unvented spaces or controlled vent spaces

What's a *Class I, II, or III*?

- I = < 0.1 perm/hr membrane vapor penetration (“diffusion”)
- II = 0.1 through 1.0
- III = > 1.0 through 10.0



§150.0(q): Fenestration U-Factor

- Fenestration (including skylights and some doors)
 - Maximum U-factor of 0.58, **or**
 - Weighted average of all fenestration cannot exceed 0.58 U-factor (exception) (some can be higher, if some are lower)
 - Other exception may apply



QUESTIONS...

About the mandatory measure changes?





*Let's talk about the changes
to the Energy Standards –
Prescriptive Measures
(New construction)*



§150.1(c)1A: Ceiling/Roof Insulation

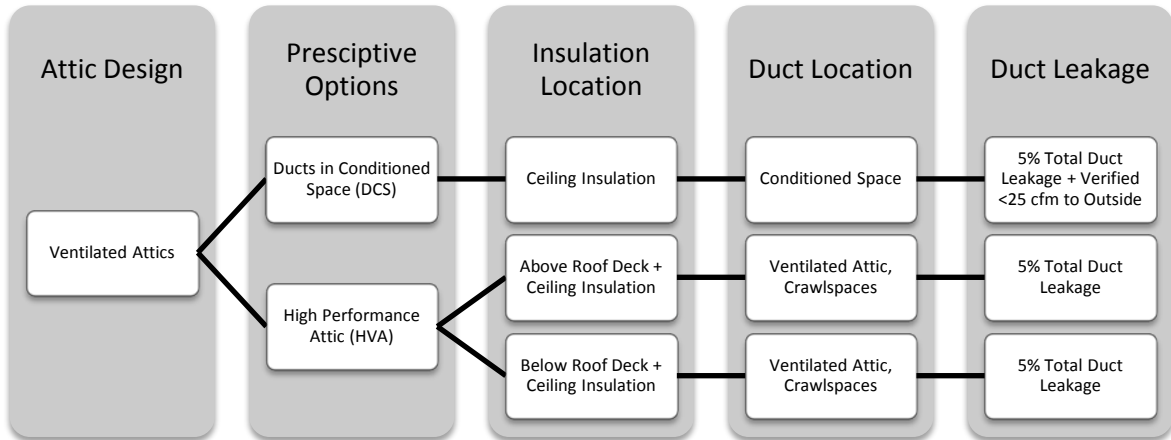
2013

- Meet R-Value or U-Factor
- Installed at ceiling or roof

2016

- Introduction of “high performance attics” requirements
- 3 Options available
- Insulation required at ceiling and roof depending on Option and Climate Zone
- Radiant barrier and duct location and insulation requirements also depend on Option and Climate Zone

Figure 4-8: Ventilated Attic Prescriptive Compliance Choices





§150.1(c)1Ai: Ceiling/Roof Insulation *cont.*

- **Option A**

➤ Per TABLE 150.1-A

- Continuous insulation required above roof rafters in some Climate Zones
- Ceiling insulation required
- Radiant barrier required in Climate Zones 2 through 15
- Must meet §150.1(c)9A

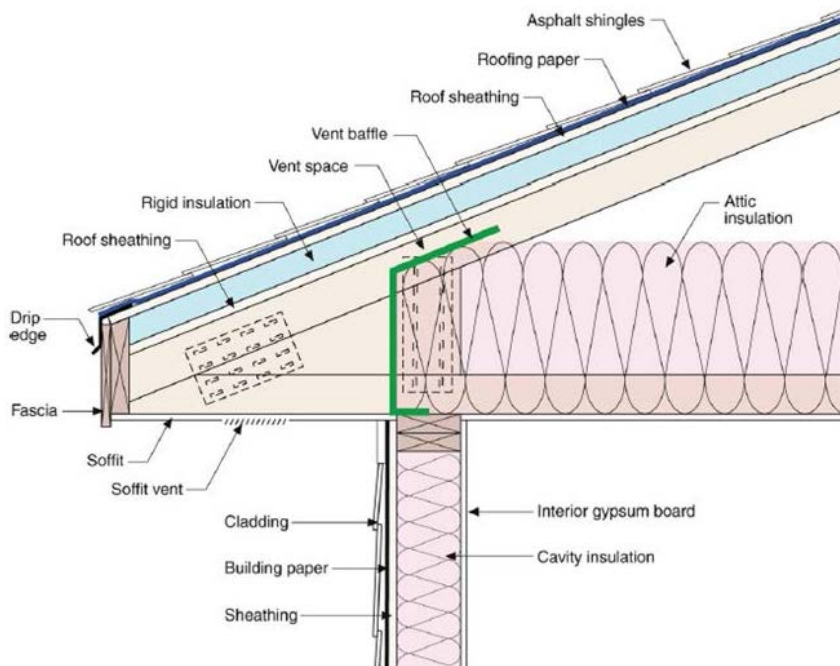


TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN

						Climate Zone															
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Roofs/Ceilings	Option A (meets §150.1(c)9A)	Continuous Insulation Above Roof Rafter	Roofing Type	No Air Space ¹	NR	NR	NR	R 8	NR	NR	NR	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	
					With Air Space ²	NR	NR	NR	R 6	NR	NR	NR	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	
		Option B (meets §150.1(c)9A)	Below Roof Deck Insulation ³	Roofing Type	No Air Space	NR	NR	NR	R 18	NR	NR	NR	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18
					With Air Space	NR	NR	NR	R 13	NR	NR	NR	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets §150.1(c)9B)	Ceiling Insulation			R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR





§150.1(c)1Aii: Ceiling/Roof Insulation *cont.*

• Option B

➤ Per TABLE 150.1-A

- Insulation required below roof deck in some Climate Zones
- Ceiling insulation required
- Radiant barrier required in Climate Zones 2, 3 and 5 through 7
- Must meet §150.1(c)9A

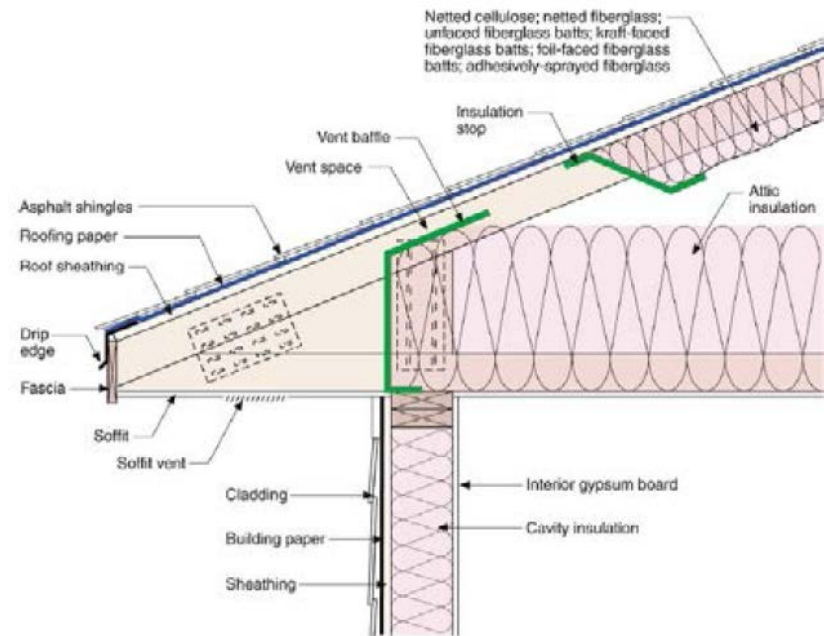


Figure 1: Venting Details for Modified Conventional Vented Attic

TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN

						Climate Zone															
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Roofs/Ceilings	Option A (meets §150.1(c)9A)	Continuous Insulation Above Roof Rafter	Roofing Type	No Air Space ¹	NR	NR	NR	R 8	NR	NR	NR	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	
					With Air Space ²	NR	NR	NR	R 6	NR	NR	NR	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR	
		Option B (meets §150.1(c)9A)	Below Roof Deck Insulation ³	Roofing Type	No Air Space	NR	NR	NR	R 18	NR	NR	NR	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18
					With Air Space	NR	NR	NR	R 13	NR	NR	NR	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets §150.1(c)9B)	Ceiling Insulation			R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR





§150.1(c)1Aiii: Ceiling/Roof Insulation *cont.*

- **Option C**

➤ Per TABLE 150.1-A

- Ceiling insulation required
- Radiant barrier required in Climate Zones 2 through 15
- Must meet §150.1(c)9B
- Ducts are located in conditioned space (HERS verified)



TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN

						Climate Zone															
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Roofs/Ceilings	Option A (meets §150.1(c)9A)	Continuous Insulation Above Roof Rafter	Roofing Type	No Air Space ¹	NR	NR	NR	R 8	NR	NR	NR	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	
					With Air Space ²	NR	NR	NR	R 6	NR	NR	NR	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR
		Option B (meets §150.1(c)9A)	Below Roof Deck Insulation ³	Roofing Type	No Air Space	NR	NR	NR	R 18	NR	NR	NR	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18
					With Air Space	NR	NR	NR	R 13	NR	NR	NR	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13
			Ceiling Insulation			R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier			NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (meets §150.1(c)9B)	Ceiling Insulation			R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier			NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR



§150.1(c)1B: Wall Insulation

2013

- Cavity insulation R-value; and
- Continuous insulation R-value

OR

- Meet U-Factor

2016

- “High performance walls” requirements introduced
- Per TABLE 150.1-A:
 - Maximum U-Factor specified
 - Required value lowered (more stringent)
 - Provides for greater design flexibility

TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN (CONTINUED)

				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Walls	Above Grade	Framed ⁴	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.065	U 0.065	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051
			Mass Wall Interior ⁵	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.059 R 17
			Mass Wall Exterior ⁶	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.1025 R 8.0	U 0.125 R 8.0	U 0.070 R 13
		Below Grade	Below Grade Interior ⁷	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.070 R 13	U 0.066 R 15
			Below Grade Exterior ⁸	U-0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19
	Floors	Slab Perimeter		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
		Raised		U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
		Concrete Raised		U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
Building Envelope	Roofing Products	Low-sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	0.63	NR
			Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	NR	0.75	NR
		Steep Sloped	Aged Solar Reflectance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.20	0.20	0.20	0.20	0.20	0.20	NR
			Thermal Emittance	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.75	0.75	0.75	0.75	0.75	0.75	NR
Building Envelope	Fenestration	Maximum U-facto		0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
		Maximum SHGC		NR	0.25	NR	0.25	NR	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
		Maximum Total Area		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
		Maximum West Facing Area		NR	5%	NR	5%	NR	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%



§150.1(c)1A, B and the Plans Examiner

- **Most applicants use Performance Approach**
 - Penalized if insulation R-values are less, or if assembly U-factor is more
 - May see more roof and continuous wall insulation
 - PV compliance credit available as trade off for HPA and HPW
- **Still verify insulation values on CF1R**
- **Still verify values match Structural/Architectural plans**

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD
Project Name: Residential Example
Calculation Description: Title 24 Analysis
Calculation Date/Time: 08/43, Wed, Dec 23, 2015
Input File Name: Res Sample.rbd16x
CF1R-PRF-01
Page 5 of 9

OPAQUE SURFACE CONSTRUCTIONS						
01	02	03	04	05	06	07
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Winter Design U-value	Assembly Layers
Garage Ext Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	none	0.351	• Inside Finish: Gypsum Board • Cavity / Frame: no insul. / 2x4 • Exterior Finish: 3 Coat Stucco
R-30 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 30	0.032	• Inside Finish: Gypsum Board • Cavity / Frame: R-9.1 / 2x4 • Over Ceiling Joists: R-20.9 insul.
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.544	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)
Attic Roof1st Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.544	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)
R-38 Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 24 in. O.C.	R 38	0.025	• Inside Finish: Gypsum Board • Cavity / Frame: R-9.1 / 2x4 • Over Ceiling Joists: R-28.9 insul.
R-19 Wall	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O.C.	R 19	0.072	• Inside Finish: Gypsum Board • Cavity / Frame: R-19 / 2x6 • Exterior Finish: 3 Coat Stucco
R-13 Wall	Interior Walls	Wood Framed Wall	2x4 @ 16 in. O.C.	R 13	0.092	• Inside Finish: Gypsum Board • Cavity / Frame: R-13 / 2x4 • Other Side Finish: Gypsum Board
Attic Roof2nd Floor Zone	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O.C.	none	0.544	• Cavity / Frame: no insul. / 2x4 Top Chrd • Roof Deck: Wood Siding/sheathing/decking • Roofing: Light Roof (Asphalt Shingle)
R-0 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x12 @ 16 in. O.C.	none	0.196	• Floor Surface: Carpeted • Floor Deck: Wood Siding/sheathing/decking • Cavity / Frame: no insul. / 2x12 • Ceiling Below Finish: Gypsum Board
R-19 Floor No Crawlspace	Interior Floors	Wood Framed Floor	2x6 @ 16 in. O.C.	R 19	0.048	• Floor Surface: Carpeted • Floor Deck: Wood Siding/sheathing/decking • Cavity / Frame: R-19 / 2x6 • Ceiling Below Finish: Gypsum Board

Registration Number: CA Building Energy Efficiency Standards - 2016 Residential Compliance
Registration Date/Time: Report Version - CF1R-11192015-401

HERS Provider:
Report Generated at: 2015-12-23 08:44:03

** Remember mand. insulation reqs.*



§150.1(c)1A, B and the Field Inspector



- **Verify installed R-values:**
 - Continuous insulation at Rough Frame
 - Both roof and walls
 - Still verify wall, ceiling, raised floor insulation at Insulation Stage
- **Verify R-values on CF2R-ENV-03-E form**
 - Must be registered with HERS Provider



§150.1(c)2: Radiant Barrier

- Required in Climate Zones 2 through 15
- Specified in Radiant Barrier section of the CF1R
- Must be installed according to Reference Residential Appendix RA4.2.1
 - Including on gable ends
- Verified separately on CF2R-ENV-04-E form
 - Including free ventilation area requirements



§150.1(c)3: Fenestration

- Fenestration
 - U-factor & solar heat gain coefficient (SHGC) no greater than shown in TABLE 150.1-A, determined per §110.6(a)
 - Exceptions for minor surface areas & for glazing types re: U-factor and SHGC
 - Be mindful of what *total fenestration area* includes:
 - Skylights; exterior doors with glazing of 50% or more
 - Stay within maximum limits of glazing per conditioned floor area
 - Stay within maximum limits of west-facing glazing per conditioned floor area

More>>>



§150.1(c)4: Fenestration

- Fenestration (cont'd)
 - Where TABLE 150.1-A requires max SHGC for climate zone, there are options to meet requirements:
 - Glazing complying with Table value, **or**
 - An exterior shading device (built-in), meeting SHGC, **or**
 - Combination of the above, meeting SHGC, **or**
 - Shading overhangs for south-faced fenestration



§150.1(c)11: Cool Roofs

- Package A requirements:
 - Density criteria removed
 - Steep-sloped roofs:
 - Minimum 0.20 SR and 0.75 TE, or 16 SRI in climate zones 10 - 15
 - Low-sloped roofs:
 - Minimum 0.63 SR and 0.75 TE, or 75 SRI in climate zones 13 and 15



QUESTIONS...

About the prescriptive requirement changes?





*Let's talk about the changes
to the Energy Standards –
Additions & Alterations
(Prescriptive Approach)*



§150.2(a): Additions

2013

- Meet prescriptive ceiling insulation requirements
- Meet prescriptive wall insulation requirements
- Recirculation pumps not allowed for water heaters
- Low efficacy lighting allowed with controls

2016

- Meet mandatory ceiling insulation required when ≤ 700 sf
- Extension of wood frame walls allowed to be same dimensions
- Demand recirculation systems with manual control pumps allowed
- All lighting must be high efficacy



§150.2(b): Alterations

2013

- Duct leakage $\leq 6\%$ required for new or replacement HVAC systems/ducts
- Allowed LED retrofit kits into cans not rated for use with LEDs

2016

- Duct leakage $\leq 5\%$ required for new or replacement HVAC systems/ducts
- LED retrofit kits are allowed if certified and marked with JA8-2016-E



§150.2(b)1A: Fenestration Alterations

- If **adding** or increasing fenestration area, must meet requirements for total area, west-facing area, U-factor, and SHGC requirements in TABLE 150.1-A, but there are exceptions:
 - Adding up to 75 sf of fenestration to your altered building does not trigger total & west fenestration area limits
 - Adding up to 16 sf of skylight with maximum U-factor 0.55 and maximum SHGC 0.30 to your altered building does not trigger total and west fenestration area limits
 - Submit CF1R-ALT form



§150.2(b)1B: Fenestration Alterations *cont.*

- If **replacing** fenestration with new fenestration (up to the total area removed), there are exceptions for the U-factor and SHGC requirements of §150.1(c)3A and §150.1(c)4:
 - Up to 75 sf of replaced glazing with $U\text{-factor} \leq 0.40$ in CZ 1-16, and $SHGC \leq 0.35$ in CZ 2, 4, 6-16 (Tab 150.1-A)
 - Replaced skylights must meet $U\text{-factor} \leq 0.55$ and $SHGC \leq 0.30$
 - Note: Replacing glass or sash within an existing frame is a repair, not an alteration



§150.2(b)1H: Re-Roofs

- If **replacing** $> 50\%$ of roofing, comply with §110.8 and SR and TE requirements (TABLE 150.1-A):
 - For steep-sloped roofs in CZ 10-15, meet a minimum aged solar reflectance of 0.20 and a minimum thermal emittance of 0.75, or SRI of 16 or more, with exceptions:
 - Air space, roof to deck
 - Profile ratio (such as barrel vault tiles)
 - Seal and insulate existing ducts
 - Provide R-38 ceiling insulation
 - Provide radiant barrier
 - Have no ducts in attic
 - $R-2 \leq$ insulation above roof deck



§150.2(b)1H: Re-Roofs

- If **replacing** > 50% of roofing, comply with §110.8 and SR and TE requirements:
 - For low-slope roofs in CZ 13 and 15 meet a minimum aged solar reflectance of 0.63 and a minimum thermal emittance of 0.75, or SRI of 75 or more, with exceptions:
 - Have no ducts in attic
 - Reflectance that meets values for roof deck insulation in TABLE 150.2-A
 - Submit CF1R-ALT form



Alt and Add Forms Preview

- Under development
- “Dynamic”
- Interactive instructions
- Scope specific
- Add and delete table rows
- Simple logic

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Prescriptive Residential Alterations That Do Not Require HERS Field Verification
CEC-CF1R-ALT-05-E (Revised 04/18)
CERTIFICATE OF COMPLIANCE
Prescriptive Residential Alterations That Do Not Require HERS Field Verification
Page 1 of 2

This compliance document is only applicable to simple alterations that do not require HERS verification for compliance. When HERS verification is required, a CF1R-ALT-01 shall first be registered with a HERS Provider Data Registry.

Alterations to Space Conditioning Systems that are exempt from HERS verification requirements may use the CF1R-ALT-05 and CF1R-ALT-05 Compliance Documents. Possible exemptions from duct leakage testing include: less than 40 ft of ducts were added or replaced; or the existing duct system was insulated with asbestos; or the existing duct system was previously tested and passed by a HERS Rater. If space conditioning systems are altered and are not exempt from HERS verification, then a CF1R-ALT-02 must be completed and registered with a HERS Provider Data Registry.

Alterations that utilize close Cell Spray Polyurethane Foam (ccSPF) with a density of 1.5 to less than 2.5 pounds per cubic foot having an R-value other than 5.8 per inch, or Open Cell Spray Polyurethane Foam (ocSPF) with a density of 0.4 to less than 1.5 pounds per cubic foot having an R-value of 3.6 per inch, shall complete and register a CF1R-ALT-01 with a HERS Provider Data Registry.

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. All applicable Mandatory Measures shall be met. Temporary labels shall not be removed before verification by the building inspector.

A. General Information

01 Project Name:	02 Date Prepared:
03 Project Location:	04 Building Front Orientation (deg or cardinal):
05 CA City:	
07 Zip Code:	
09 Climate Zone:	
11 Building Type:	

13 Project Scope (Select all that apply):

☐ B. Insulation

☐ C. Roof Replacement

CA Building Energy Efficiency Standards - 2016 R

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Prescriptive Residential Additions 300 Ft² or Less, or Additions That Do Not Require HERS Field Verification
CEC-CF1R-ADD-02-E (Revised 04/18)
CERTIFICATE OF COMPLIANCE
Prescriptive Residential Additions 300 Ft² or Less, or Additions That Do Not Require HERS Field Verification
Page 1 of 2

This compliance document is only applicable to additions 300 ft² or less, or additions that do not require HERS field verification for compliance. When HERS verification is required, a CF1R-ADD-01 shall first be registered with a HERS Provider Data Registry.

Alterations to Space Conditioning Systems that are exempt from HERS verification requirements may use the CF1R-ADD-02 and CF1R-ADD-02 Compliance Documents. Possible exemptions from duct leakage testing include: less than 40 ft of ducts were added or replaced; or the existing duct system was insulated with asbestos; or the existing duct system was previously tested and passed by a HERS Rater. If space conditioning systems are altered and are not exempt from HERS verification, then a CF1R-ADD-01 must be completed and registered with a HERS Provider Data Registry.

Additions or alterations that utilize close Cell Spray Polyurethane Foam (ccSPF) with a density of 1.5 to less than 2.5 pounds per cubic foot having an R-value other than 5.8 per inch, or Open Cell Spray Polyurethane Foam (ocSPF) with a density of 0.4 to less than 1.5 pounds per cubic foot having an R-value of 3.6 per inch, shall complete and register a CF1R-ADD-01 with a HERS Provider Data Registry.

If more than one person has responsibility for installation of the items on this certificate, each person shall prepare and sign a certificate applicable to the portion of construction for which they are responsible. Alternatively, the person with chief responsibility for construction shall prepare and sign this certificate for the entire construction. All applicable Mandatory Measures shall be met. Temporary labels shall not be removed before verification by the building inspector.

A. General Information

01 Project Name:	02 Date Prepared:
03 Project Location:	04 Building Front Orientation (deg):
05 CA City:	08 Number of Dwelling Units with Additions:
07 Zip Code:	08 Fuel Type:
09 Climate Zone:	10 Total Conditioned Floor Area (ft ²) (Addition):
11 Building Type:	12 Slab Area (ft ²):

13 Project Scope:

☐ Addition Wall Type: ☐ Framed ☐ Non-framed ☐ Mass Walls ☐ None

☐ Roof Type: ☐ Steep slope ☐ Low slope ☐ None

☐ Roof/Ceiling insulation: ☐ Option A - Above deck insulation ☐ Option B - Below deck insulation ☐ Option C - Ducts & Air handler in conditioned space ☐ None

☐ Windows being installed? ☐ Yes ☐ No

☐ New water heater being installed? ☐ Yes ☐ No

CA Building Energy Efficiency Standards - 2016 Residential Compliance April 2018



Forms Exception – *Reminder..*

§10-103

- For alterations and additions $< 300 \text{ ft}^2$ that do not require HERS testing:
 - Building Department may not require CF1R and CF2R forms
 - OR, can create simplified versions
- Does not exempt applicant from complying with code; only forms
- Can include requirements on permit application for simplification



*Let's finish with some
Resources*



Approved 2016 Compliance Software

Used to demonstrate compliance with the Energy Standards when using the Performance Approach

- **Residential**
 - CBECC-Res
 - Energy Pro
 - Wrightsoft Right-Energy
- **Nonresidential**
 - CBECC-Com
 - Energy Pro
 - IES Virtual Environment

More information at:

http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html



2016 Approved HERS Providers

- **New construction, HVAC alterations, and Whole House Ratings**
 - CalCERTS
 - CHEERS

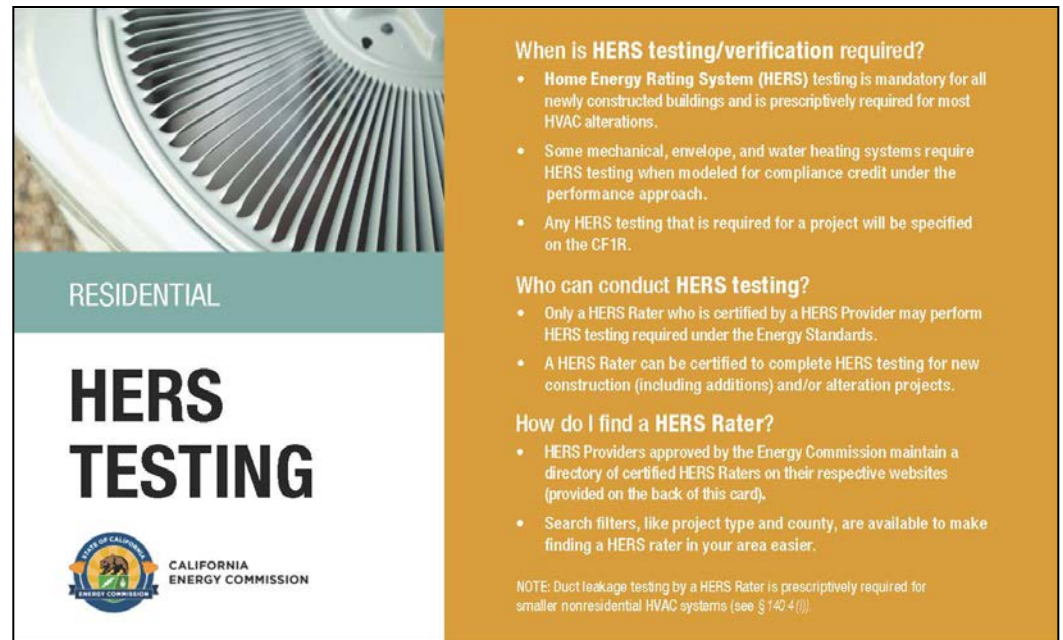
More information at:

http://www.energy.ca.gov/HERS/providers_2016standards.html



HERS Counter Card

- Available now online
- CEC will print soon and provide copies
- Intended to assist counter staff and permit techs
- Inform applicants about HERS testing and verification





Blueprint

- Published every other month
- Clarifications on frequently asked questions
- Receive by email
- <http://www.energy.ca.gov/efficiency/blueprint/>

Issue 113 | March - April 2016

BLUEPRINT

California Energy Commission
Efficiency Division



In This Issue

- › New Mechanical Acceptance Test Technician Certification Provider
- › Small Duct High Velocity Space Conditioning Systems
- › Demand Responsive Controls for Additions and Alterations
- › Residential Water Heating Options
- › EnergyPro Version 7.0
- › Alternative Path for Complying with Lighting Alteration Requirements
- › Lighting Standards to Save Californians More Than \$4 Billion in Electricity Costs
- › Q&A
 - Illuminated Areas
 - Track Lighting Alterations
 - Compliance Documents
 - Townhouses and Duplexes
 - Commissioning
- › Energy Code Ace Training Schedule

This gives NEBB the authority to train, certify, and oversee acceptance test technicians (ATTs) and their employers. NEBB will train and certify ATTs to perform all 17 mechanical acceptance tests required in the 2013 *Building Energy Efficiency Standards* (Energy Standards).

The Conditions of Approval are available for review in the **Executive Director's recommendation**.

For more information, please visit:
<http://energy.ca.gov/title24/attcp/>

Small Duct High Velocity Space Conditioning Systems

Small duct high velocity (SDHV) systems may be used to comply with the Energy Standards. The following is a list of requirements with direction on how SDHV systems can comply with the low-rise residential requirements of the Energy Standards.

Mandatory Requirements

United States Department of Energy Standards:

SDHV systems manufactured on or after January 23, 2006, and before January 1, 2015, must have a minimum Seasonal Energy Efficiency Ratio (SEER) of 11, and a minimum Heating Seasonal Performance Factor (HSPF) of 6.8.

SDHV systems manufactured on or after January 1, 2015, must have a minimum SEER of 12, and a minimum HSPF of 7.2.

Energy Standards:

Section 150.0(m)13B - Single zone systems that use forced air ducts to supply cooled air to an occupiable space must either meet minimum airflow and fan efficacy requirements, or meet the return duct and grille sizing requirements of **TABLES 150.0-C or 150.0-D**.

NOTE: The return duct and grille sizing alternative will likely be the method chosen for compliance when installing a SDHV system.

Section 150.0(m)15 - Specific to systems with multiple thermostatically controlled zones, this section requires the same mandatory airflow and fan efficacy requirements as **Section 150.0(m)13B**. However, it does not have the same duct and grille sizing alternative. If such systems cannot satisfy the airflow and fan efficacy requirements of this section, compliance must be demonstrated via the performance approach.

Prescriptive Requirements

The duct leakage and insulation requirements apply as with any other system.

New Mechanical Acceptance Test Technician Certification Provider

On January 13, 2016, the California Energy Commission (Energy Commission) approved the National Environmental Balancing Bureau (NEBB), as a mechanical Acceptance Test Technician Certification Provider (ATTCP).



Online Resource Center (ORC)

Online Resource Center

The Online Resource Center is provided to assist the building community and enforcement agencies with Building Energy Efficiency Standards (Energy Standards) compliance. Energy Standards apply to newly constructed buildings, as well as additions and alterations for existing buildings. Presently, the Energy Standards are updated every three years.

To assist in the compliance process, we provide compliance documents and free Public Domain Compliance Software programs for commercial and residential buildings. Training and links to the Energy Standards and compliance software are available on the Energy Commission website and at utility training centers throughout the state. To help direct you to an appropriate resource, Energy Commission and external resource information are provided on this page.

Building Energy Efficiency Standards



2016
Energy Standards



2013
Energy Standards



Past
Energy Standards

Energy Standards Information and Training Materials



Overview



Commissioning



Covered Processes

Follow



Energy Standards Questions?

Energy Standards Hotline

Energy Standards Booth Handouts

Handouts - 05042016 (zip file, 285 mb)
Help with the zip file

Trainings & Events

Energy Commission's
Outreach & Education Schedule
Utility Sponsored Training Schedules

Subscribe

Building Standards List Serve

Automated Email Notifications

First name:

Last name:

Email address:

You will receive an email requesting that you confirm your subscription.

Send Reset

<http://www.energy.ca.gov/title24/orc/>



Energy Code Ace

- Forms tools
- Free training (in person and online)
- Checklists, Trigger Sheets for building dept.
- <http://www.energycodeace.com>

Did you Know?

Permits Can Save Energy
Statewide gross savings from Codes & Standards realized between now and 2020 is approximately equivalent to:

Deferring the need to run a 500 MW power plant for 16 years

Removing 2.6 million cars from the road

Permits Can Save Money

and Protect the Value of Your Home Investment:

Non-permitted home improvements may not retain their value when you sell

Permits Can Save Reputations

Clients value quality and integrity.

Pulling a permit means you are doing it right and can be trusted as a quality contractor who doesn't take shortcuts.

Not pulling a permit is breaking the law – and can cost you your contractor's license.



"Comply With Me"

Performed by the Irvington High School Viking Marching Band
Watch the full video here.

We offer FREE:



A variety of tools to help you identify the forms, installation techniques, and standards relevant to building projects in California.



Classroom and online trainings on Title 24, Part 6. Additional 2013 classes coming soon!



Fact Sheets, Trigger Sheets and Checklists to help you understand when Title 24, Part 6 is "triggered" and how to correctly comply

Log In or Register

Enter your e-mail address below to log in or to register a new account.

ENTER YOUR EMAIL BELOW

Go

It's time to comply - the 2013 Building Energy Code is now in effect!

Energy Code Ace FREE Tools, Training and Resources can help you be prepared to comply, and our rendition of "Comply With Me" will help you do it with a bounce in your step and smile on your face (ok, ok – but at least it's fun to watch!) See the "teaser" on our Home page and the full version on the EnergyCodeAce YouTube channel. Special thanks to the amazing Irvington High School Viking Marching Band!

Countdown to July 1:

0 Months 0 Days 0 Hours

Calendar

Click on the blue dates to view event details

March 2013						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				



Energy Standards Hotline

- Toll-free in California
- Open Monday through Friday
 - 8:00 a.m. to noon, and
1:00 p.m. to 4:30 p.m.
- Call at:
 - 800-772-3300 (In CA)
 - 916-654-5106 (Outside CA)
- Email at: Title24@energy.ca.gov



Email Lists

- Main conduit for communicating with stakeholders
- Sign up at:
 - <http://www.energy.ca.gov/listservers/>
- Subscribe to the following Efficiency Lists:
 - Building Standards
 - Blueprint
- Respond to confirmation email within 24 hours